POPULAR SCIENCE

MONTHLY

MECHANICS - AUTOS - HOMEBUILDING

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Best Christmas Toys You Can Build PAGE 179

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Full Report on 1954 Power Steering PAGE 169

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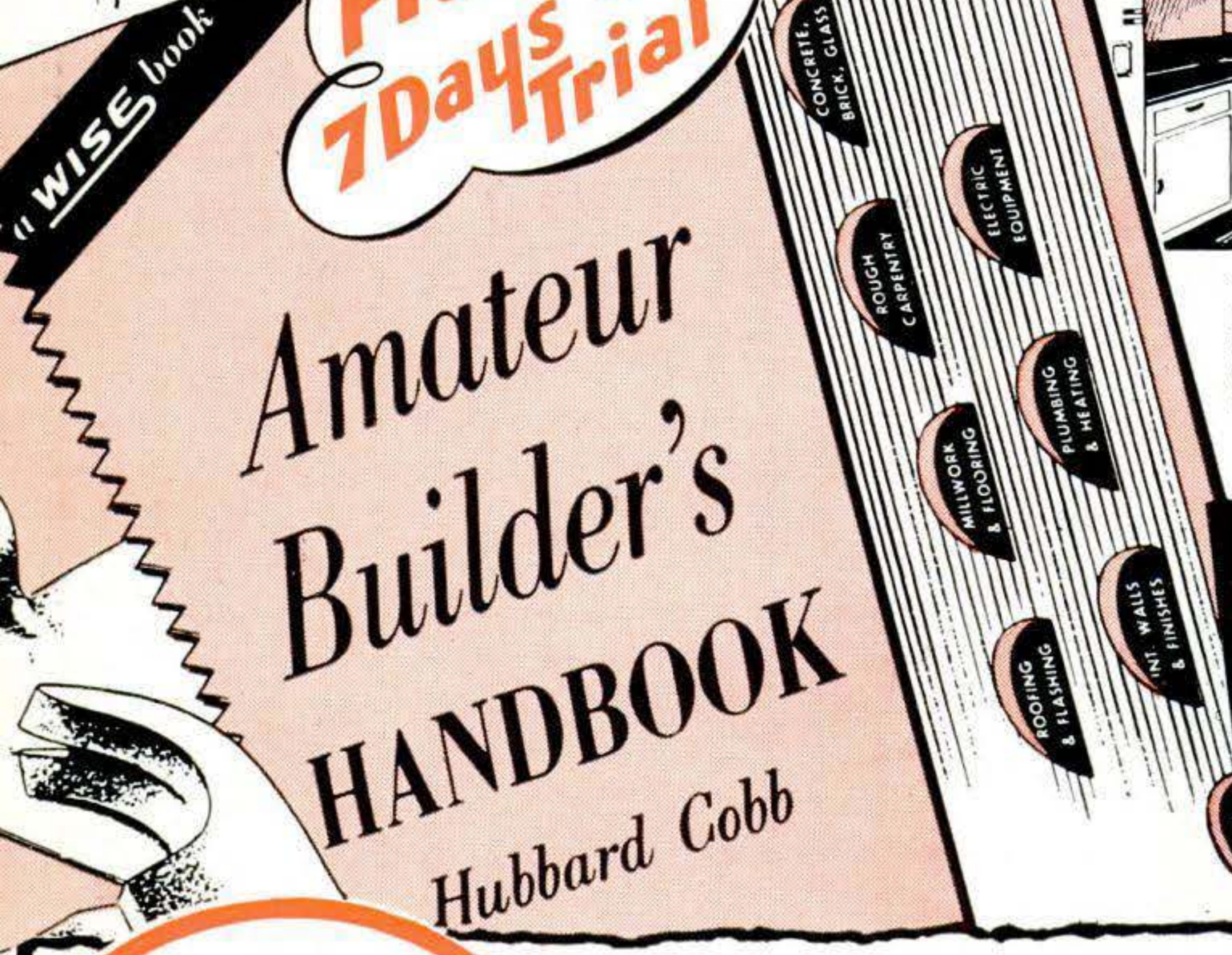

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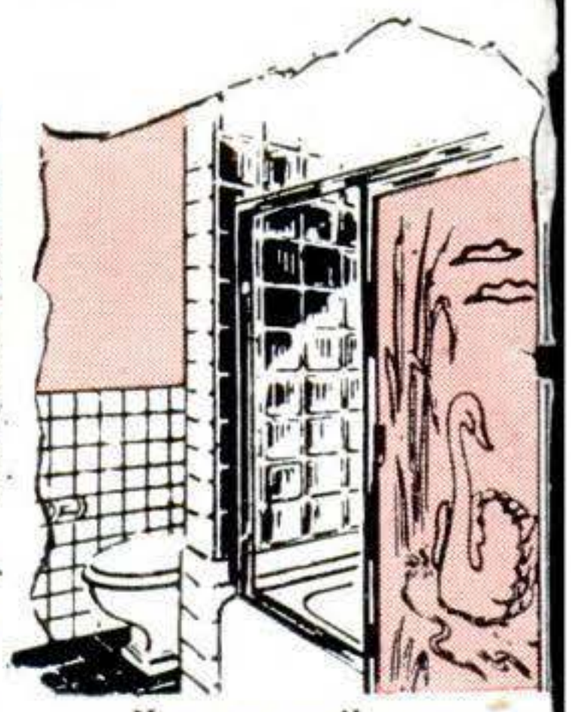

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MORE THAN 1,000 "How-to-Do-It" Pictures!
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300,000 Words, 512 Pages of Room-by-Room Ideas
by Famous "Handyman" Hubbard Cobb

Ideas on using glass blocks to give rooms glamor, better lighting!

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1. Concrete, Masonry, Bricks, Glass
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3. Millwork, Windows, Doors, Screens, Floors
4. Roofs, Insulation, Ventilation, Heating
5. Interior Finish, Plaster, Linoleum, Tile,
6. Plumbing, Heating, Fireplaces, Chimneys
7. Tools, Hardware for Your EVERY Need
8. Paints, Varnishes, Sprayers, Brushes
9. Electrical Wiring, Fixtures

and Many Other Features!

Here Is a Mere Glimpse of Immense List of Contents:

1001 Money-Saving Ideas on EVERY Phase of Home Improvement Show How YOU Can Have the Luxury Home You've Longed for!

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Shower Stall Water-proofing
Correcting Sagging Wall
Glass Block Doorways, Walls
Concrete-Pouring Methods, Tools
Wood Frames,

Cap Flashing, shown here, is one of hundreds of roofing features!

Brick Veneer
Arches, Doorways, Partitions
Patterns in Bricklaying
Concrete Masonry Walls
Brick Facing
Concrete Steps

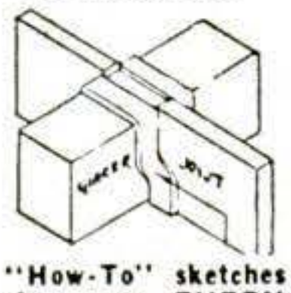
CARPENTRY

Lumber—Standard Measurements
Lumber Defects—How to Recognize
Roof, Nailing
Wall Bracing
Partitions, Wood
Plywoods, Fences
Stairs, Outdoor, Cellar
Kitchens—Plans and Designs

Joining Roof to Walls

ROOFS, INSULATION, VENTILATION, FLASHING

Installing Flashing—Diagrams, Instructions, Valleys, Chimneys, Hips, Windows, Doorways, etc.
Types of Insulation
Insulating Farm Buildings
Types of Shingles, Walls, Roofs, Hips, Ridges, etc.
How-To, How-Not-To Ideas
Tips on Repairing, Replacing
Leaks in Old Roofs
Roofing, Instructions



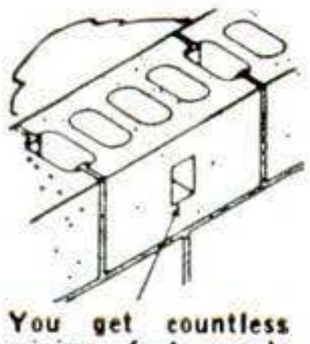
"How-To" sketches show you EVERY type of joist you'll ever need!

MILLWORK, WINDOWS, DOORS, SCREENS, FLOORS

Floors—Nailing, Laying, Finishing
Edgings, Doorways
Storm Windows, Doors
Shelves, Cabinets
Adjusting Doors
Built-In Furniture
Bathroom Cabinets
Closets, Working Bins

PLASTER, LINOLEUM, TILE

Tileboards
Repairing Walls
Tile-Laying Tips
Wall Plaster Mixing
Exterior and Interior Walls
Door, Window Openings, Trims
Wall Board Installation



You get countless wiring facts such as installing outlets, even in concrete!

Linoleum Laying
Lifetime Wall Coverings
Repairing Ceilings
Installing New Ceilings
Making Rooms Seem Larger, Wider
Installing Ceiling Panels

HEATING, PLUMBING, CHIMNEYS

Building Fireplaces
Plumbing, Pipes of All Kinds
Faucet Installations
Coal Bins, Construction
Fixtures, Tubs, Sinks, Showers
Saving on Fuels
Duplex Bathrooms

Chimney Construction
Hot Water Systems
Making Woods Fire-Resistant

PAINTS, VARNISHES

Tinting
Cleaning Paint Spots
Floor Sealers
Decorating Old Floors
Color, Decorating Tips
Types of Finish—When, Where, How to Use
Whitewashing, Ingredients
Painting Wood Floors
Paints for Brick, Concrete, Plaster

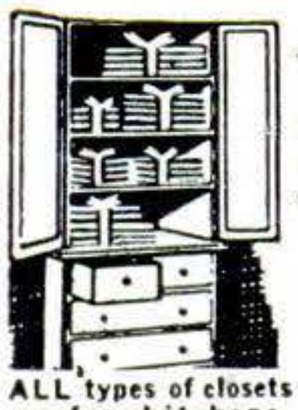
TOOLS, NAILS, HARDWARE

Scaffolds
Ladders, Use and Precautions
Sliding Windows
Latches
Screens—Repairing, Replacing, Construction, Painting, Installation
Bolts, Screws, Nails—All types and Sizes

ELECTRICITY

Switches

Individual Room Heating
Thermostats
Kitchen Outlets
Bells, Chimes
Lamps, Types, Best Placing
Low-Voltage Wiring
Approved Labels



ALL types of closets — for kitchens, bathrooms, bedrooms, etc.

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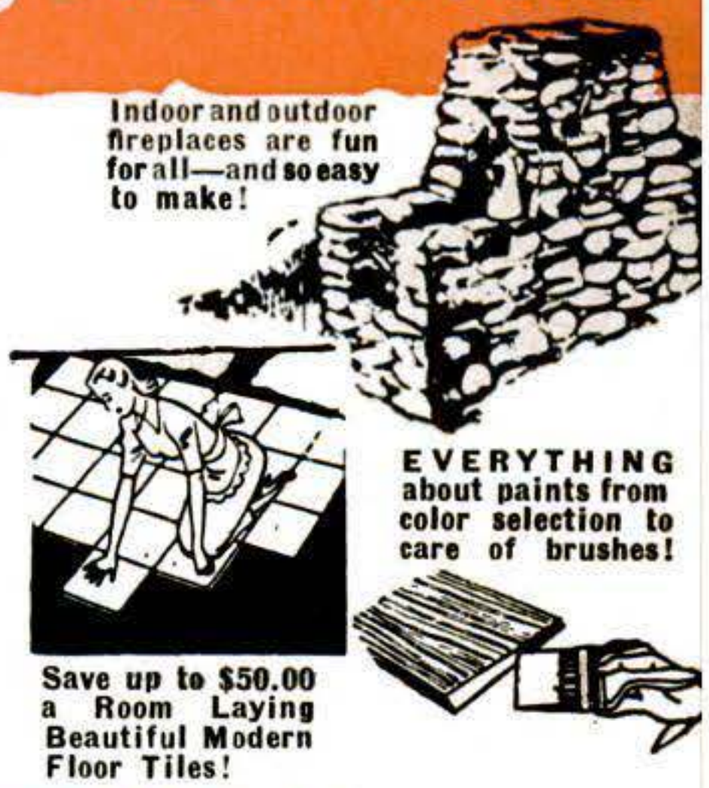

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NOVEMBER, 1953

Gus Wins a Thanksgiving Dinner

***They had bagged** the season's biggest buck. Problem: how to get it down the mountain—in a jeep that wouldn't start. Solution: call Gus Wilson at the Model Garage. Details: see p. 196*

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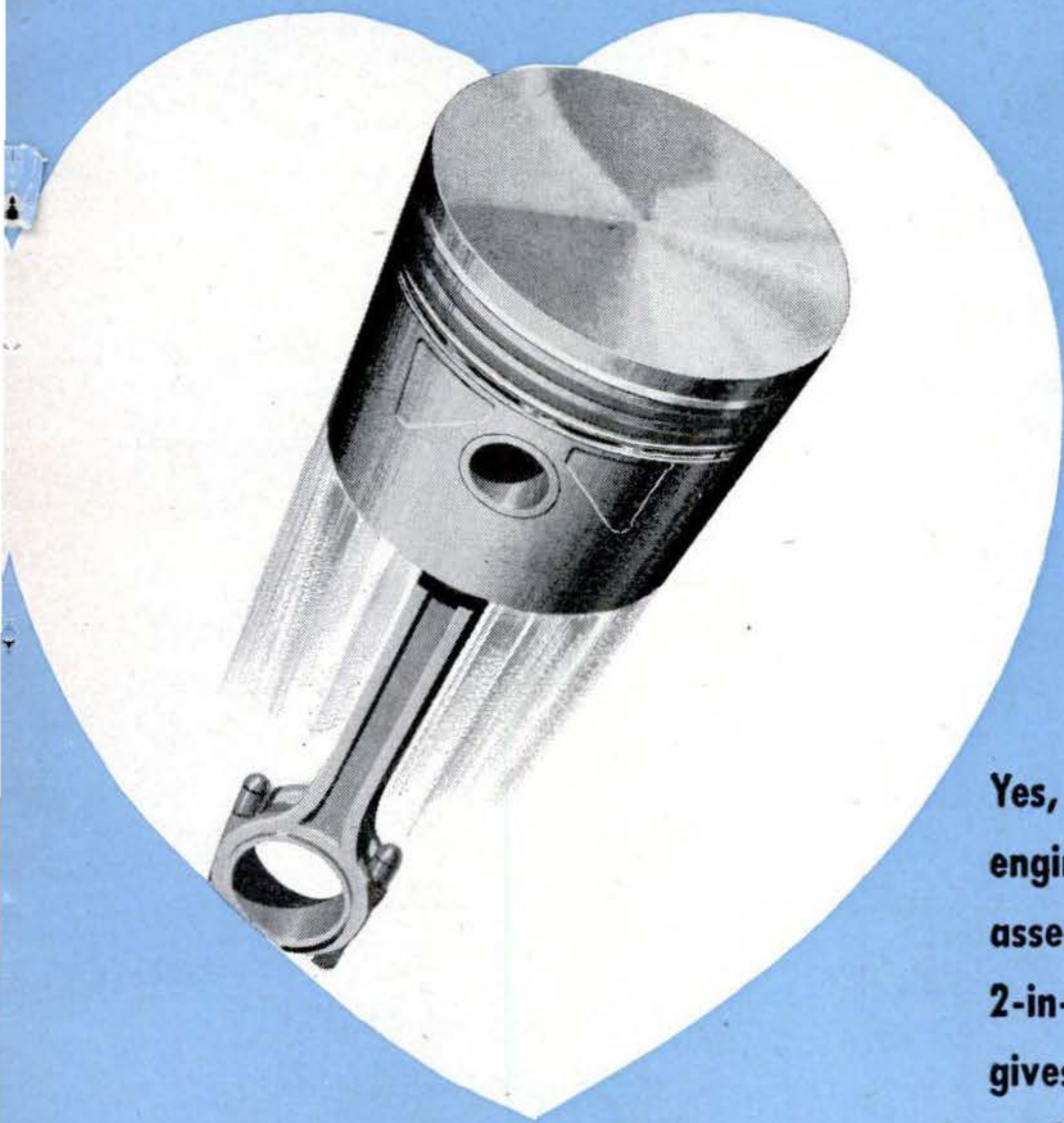
Chrome



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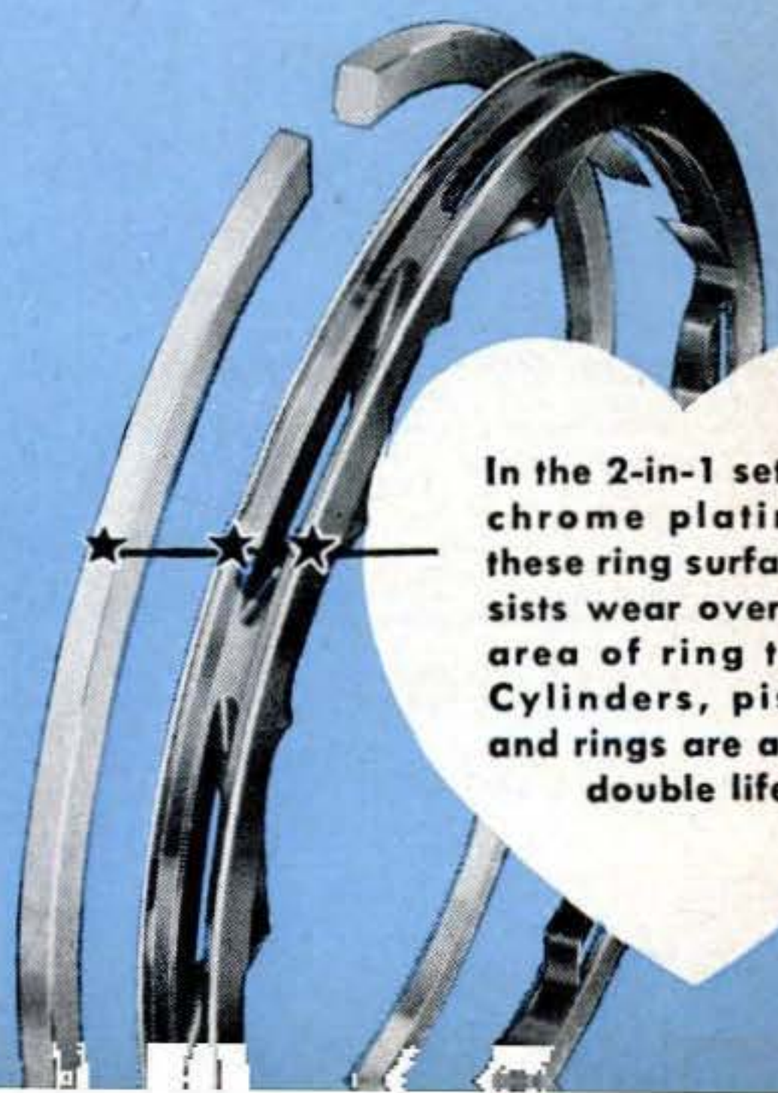

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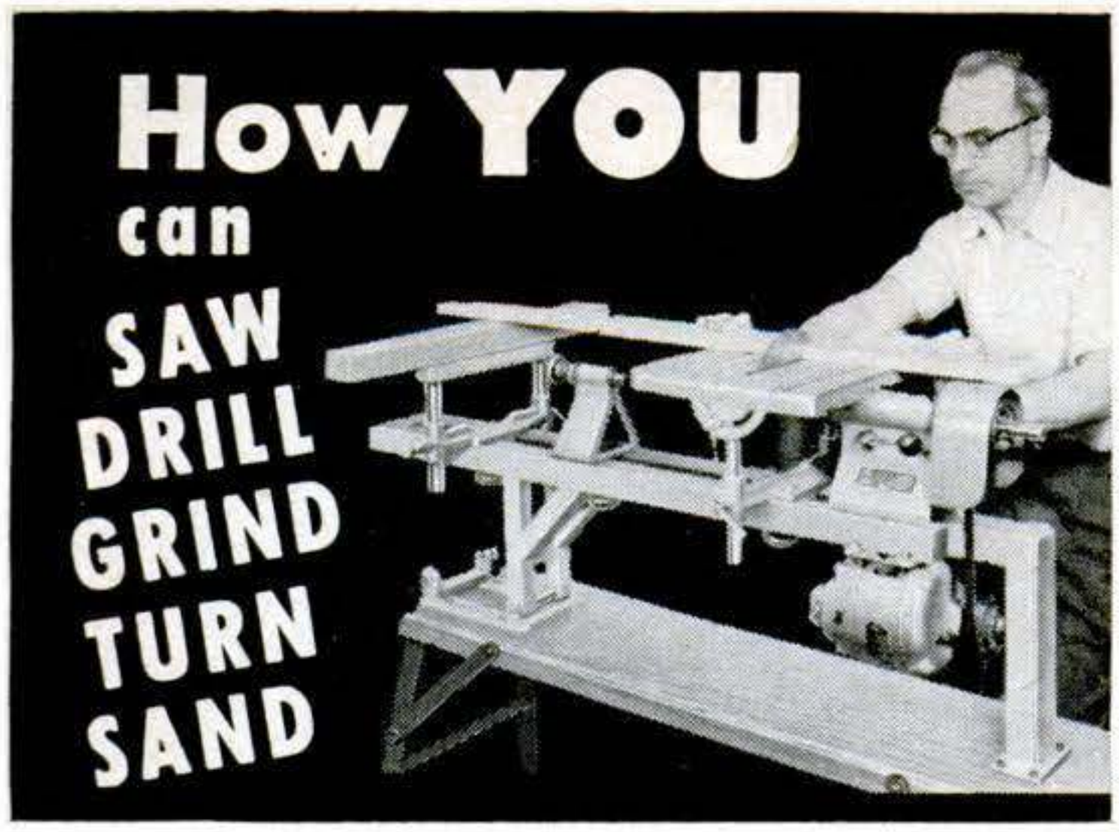

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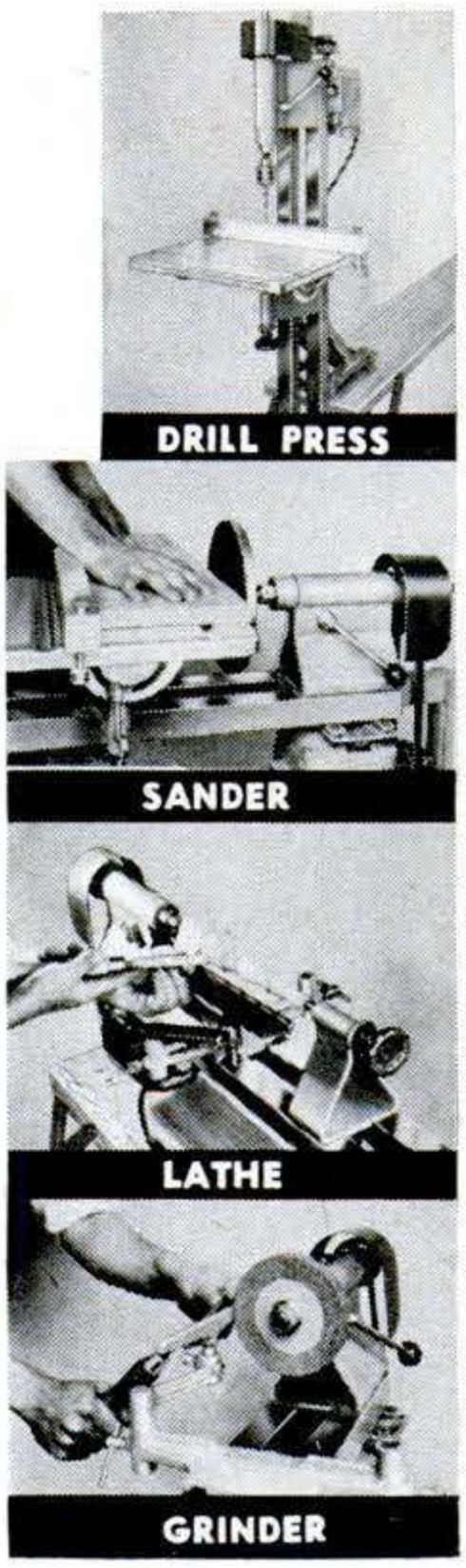

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NEXT MONTH . . .

How to Install a Car Safety Belt

Installing a seat belt in your car not only will keep you safer; it will make you a better driver, too. Because it gives what fliers know as a "seat of the pants" feel, you sense an impending skid or softening tire before it causes trouble. E. F. Lindsley will tell you about this, and offer installation tips, in the December issue.

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- ☐ Auto Body Rebuilding and Refinishing
- ☐ Diesel—Gas Engines

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- ☐ Radio Servicing—FM
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- ☐ Diesel Locomotive
- ☐ Air Brakes ☐ Car Inspector
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60 SECONDS LATER...

THE FUN BEGINS!

You open the back and lift out a beautiful, finished picture. The family crowds around to admire it. And when friends come, you show them the wonderful pictures you snapped that very morning.

HAVE YOU SEEN TODAY'S POLAROID PICTURES?

- They're big, sparkling black and white prints like this.
- A new plastic finish gives them lasting beauty.
- Every roll of film is guaranteed.*

NO WONDERING HOW THEY "CAME OUT"

No need to waste film making *extra* shots — just to be sure. If the subject moves or the pose isn't right, you know at once and can shoot again before a once-in-a-lifetime picture is lost forever.

YOU'LL HAVE ENLARGEMENTS AND COPIES MADE

directly from your prints by Polaroid's special process. They'll come back to you so quickly and cost so little, you'll wonder why you ever kept dusty files of negatives.

YOU'LL HAVE A LIFETIME OF FUN

On vacation, you'll have your pictures as you snap them — to show new friends, to mail right off, to jot names and dates on the back. At any get-together, you'll add to the fun with 60-second pictures.

See your photo dealer soon — while he still has Polaroid Cameras on hand for Christmas. Ask for a demonstration. You'll be amazed how easy it is to load and use — how sharp and clear today's 60-second pictures are.

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MODEL 95 — the thrifty family camera anyone can use indoors or out, rain or shine.

**If you're ever dissatisfied with the results from any roll, send the pictures to Polaroid and you'll get a new roll free.*

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Model 95

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Polaroid Corporation, Cambridge 39, Mass.

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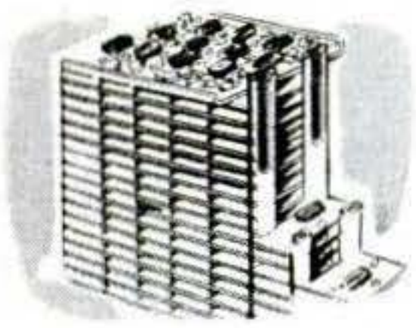
Don't put in a drop of anti-freeze...

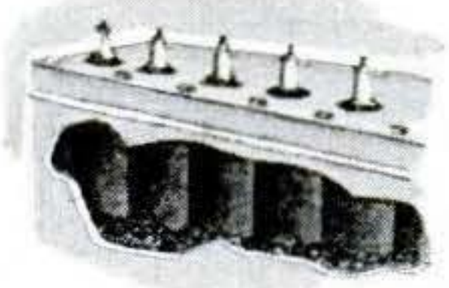
UNTIL YOU'VE CLEANED OUT RUST WITH

DU PONT *Cooling System* CLEANSER

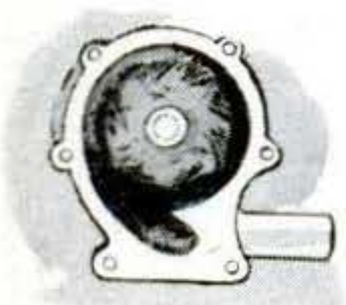
HOW RUST AND ACID CORROSION WASTE ANTI-FREEZE . . . CAUSE TROUBLE AND EXPENSE



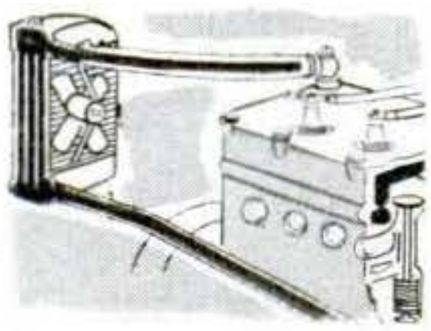
Accumulated rust, scale and corrosion plug radiator passages. This slows down circulation, may cause leaks. Anti-freeze may leak out . . . or "boil out" as motor overheats.



Acid corrosion and rust take place in engine block, too. Circulation slows down, proper cooling becomes impossible. Motor overheats and causes "boiling out" or creeping of anti-freeze.



Water-pump impeller blade is often attacked and eaten away by rust and corrosion. This causes failure of circulation in cooling system and dangerous overheating.



The heater is also part of your car's cooling system. Rust, scale and acid corrosion can impair its operation by clogging passages or destroying vital parts such as tubes.

Before you put in anti-freeze, your car's cooling system needs a careful check-up.

Clean out rust and scale—safely, easily, thoroughly — with Du Pont Cooling System Cleanser.

Simply pour Du Pont cleanser in the radiator and run the motor. It works even while you're driving . . . dissolves rust so it can be drained out. No reverse flushing necessary. Neutralizer is included in each can to complete the job. Insist on the original and genuine Du Pont Cleanser, marketed only by Du Pont in a package bearing the red Du Pont oval trade mark.

Ask about the complete Du Pont pre-anti-freeze service at your service station today and assure trouble-free driving this winter. Or get a can of Du Pont Cooling System Cleanser at your auto supply store . . . $1.25 at most dealers.

Insure against leaks that waste anti-freeze with DU PONT Cooling System SEALER

Even though your cooling system seems watertight, many permanent anti-freezes will "creep" through tiny pinholes. You can stop this seepage immediately with Du Pont Cooling System Sealer. Simply pour it into your radiator. It can't clog or harm hose or metal parts.

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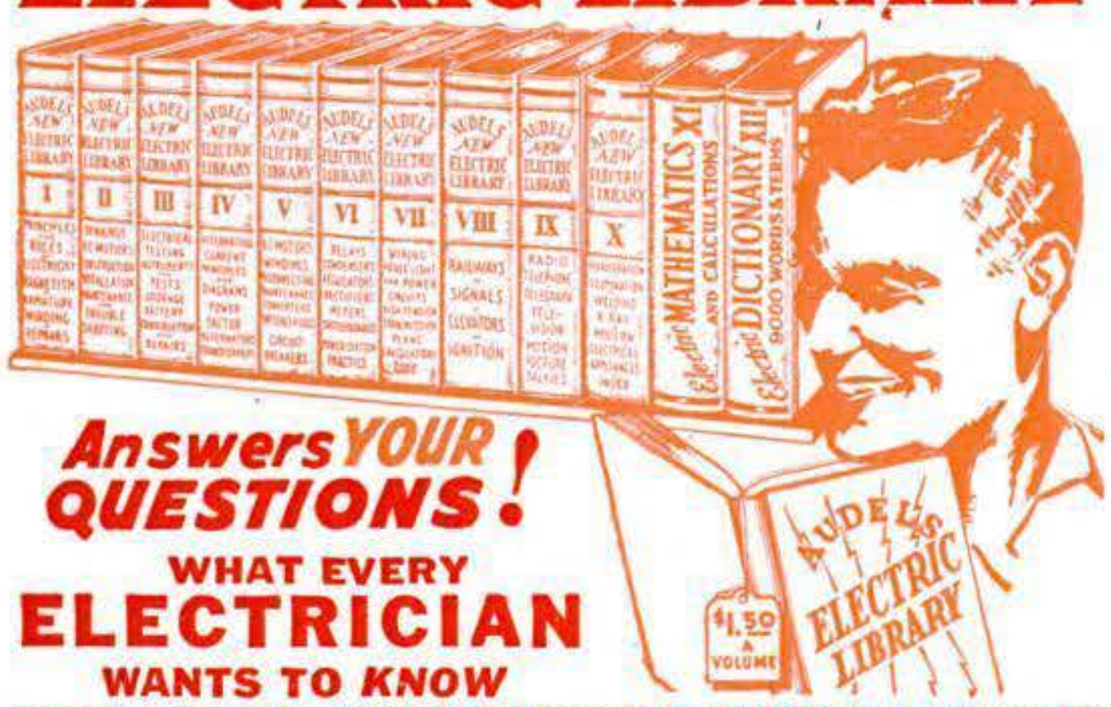

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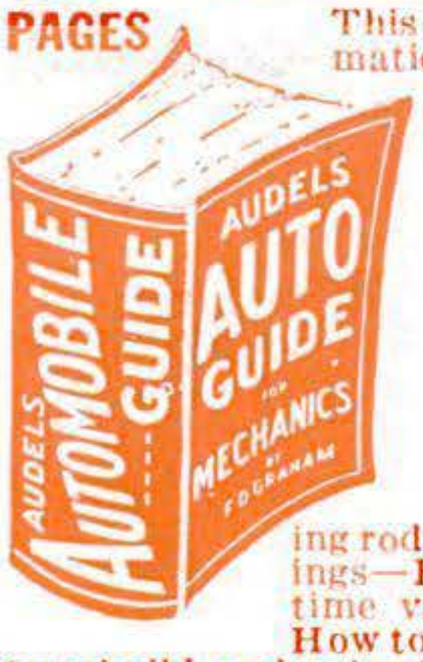

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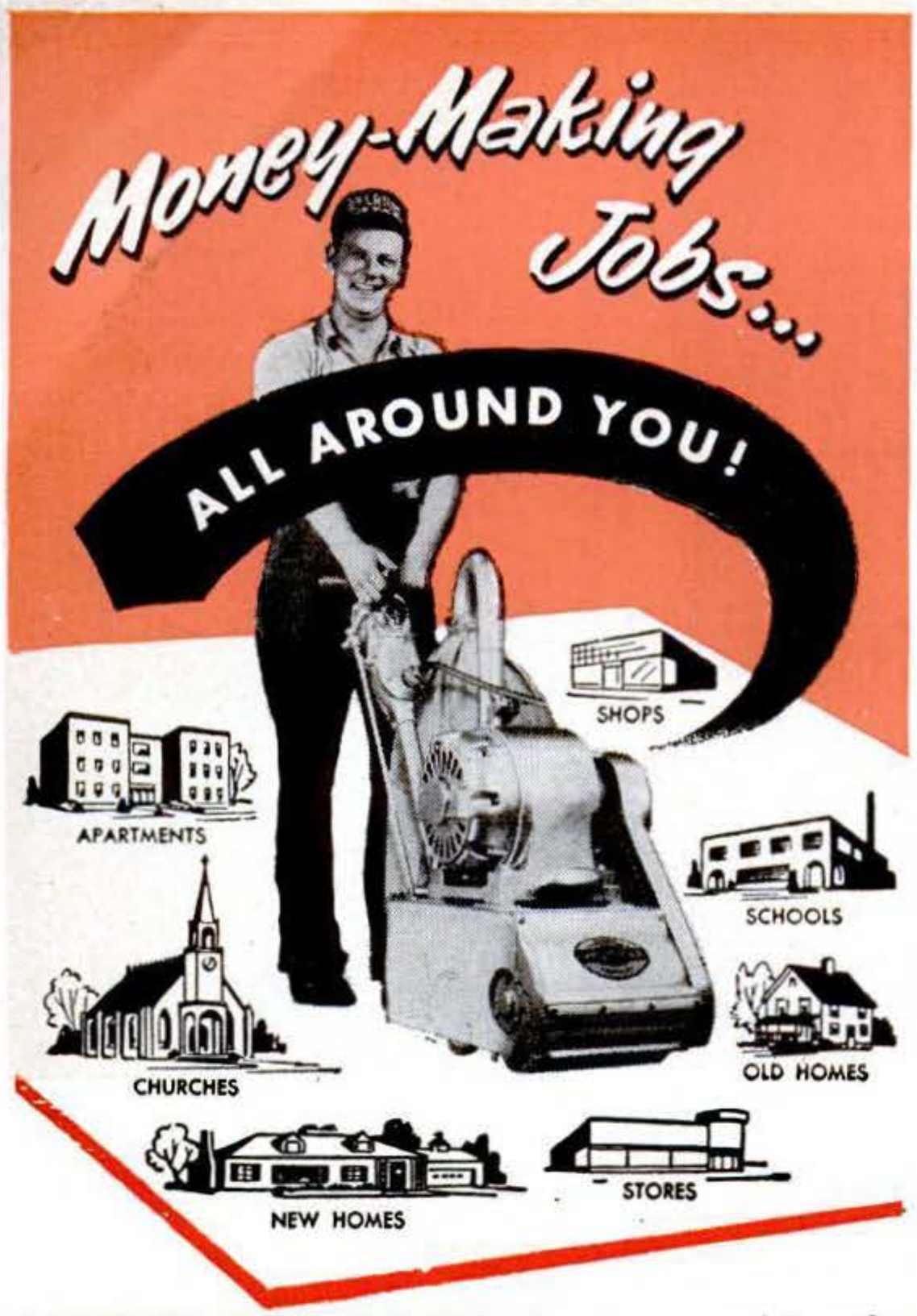

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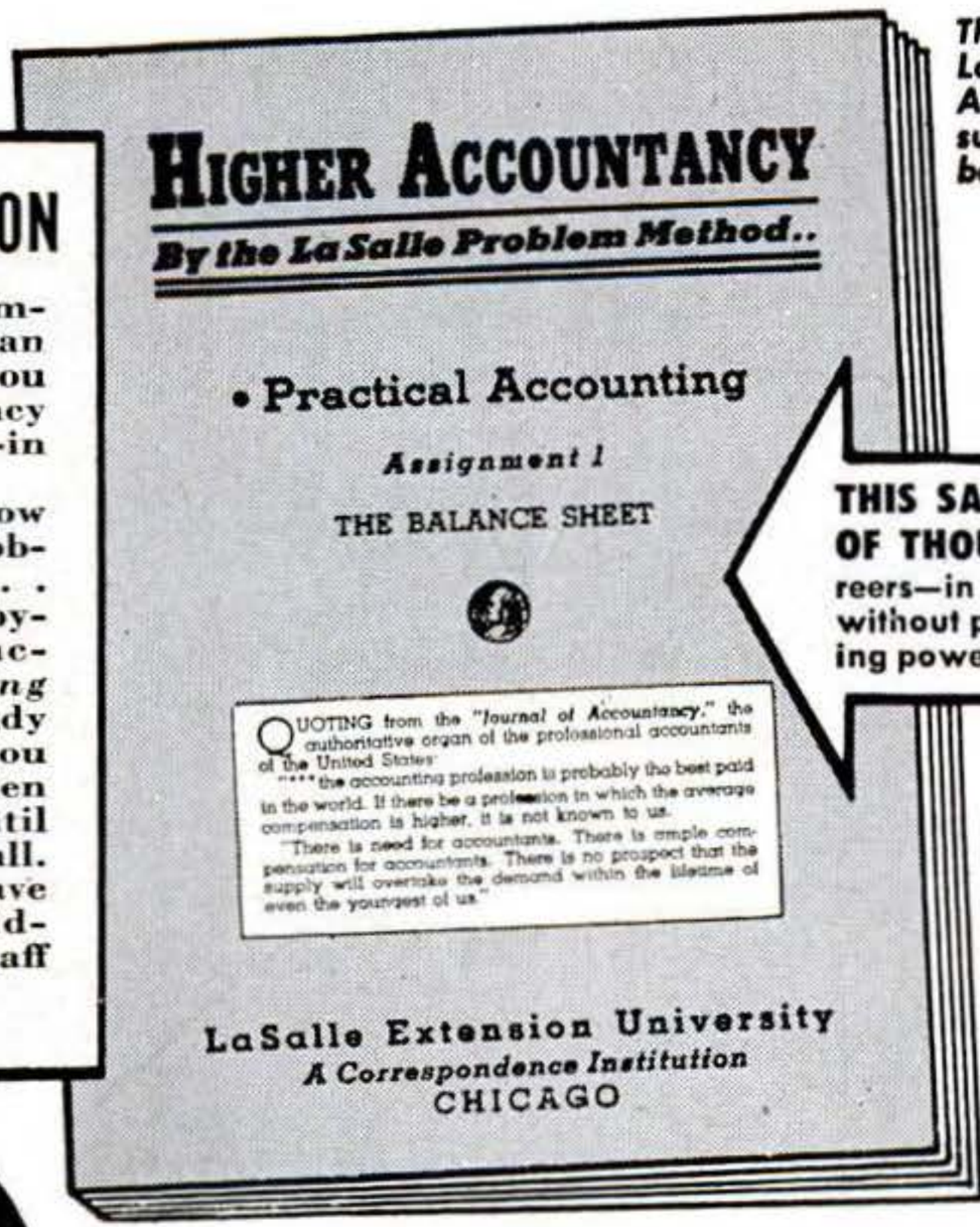

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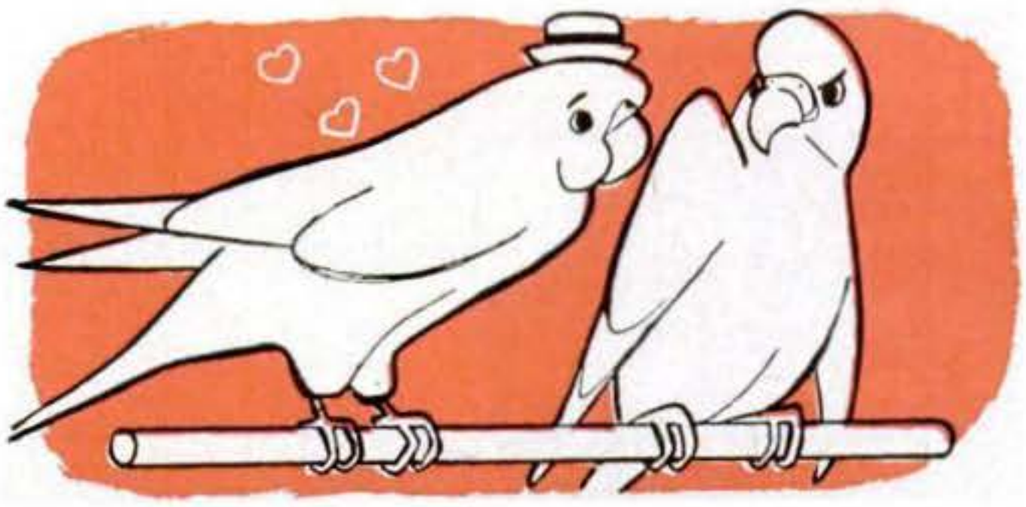
Letters—

Add Parakeets

You may be interested in knowing that Mrs. Micawber, the parakeet my husband wrote about in the October issue, is a mother. At this writing she has hatched the first egg out of a clutch of six. We expect the rest of the fledglings to arrive in the next 10 days—one every other day.

We had doubts about Mrs. M.'s interest in motherhood because she had been a household pet. The fact is that she disdained the first male we put in the cage. Wilbur



Crane, the breeder, suggested that we bring her to his aviary where she could hear the cheeping of fledglings. That, and another mate, did the trick.

MRS. DEVON FRANCIS, White Plains, N. Y.

Misplaced Caution

I applaud your efforts to protect readers from accidents, but I think you carried caution too far when you warned them [August, p. 183] that chloroform is inflammable.

It isn't.

ELMER F. WAY, Chicago.

Our intentions were better than our chemistry. We should have warned that the stuff should be used only in well-ventilated rooms because of the toxic qualities of its fumes.

Some Clocks Are Ambidextrous

An article in PSM [June, '53, p. 217] suggests using an alarm-clock winding key

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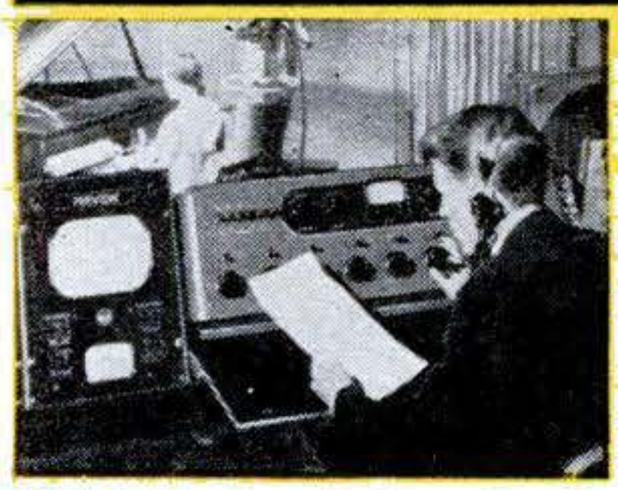

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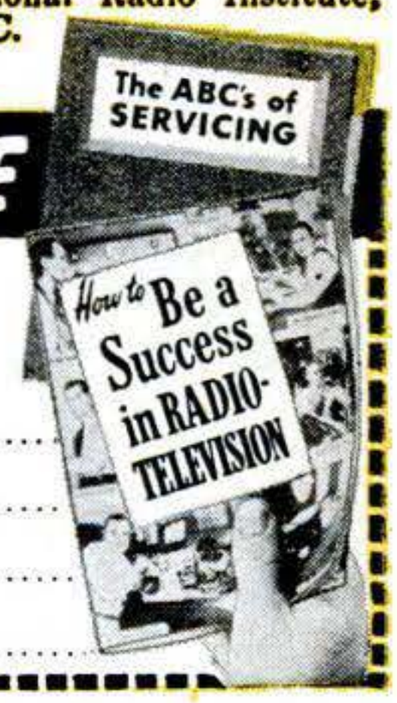

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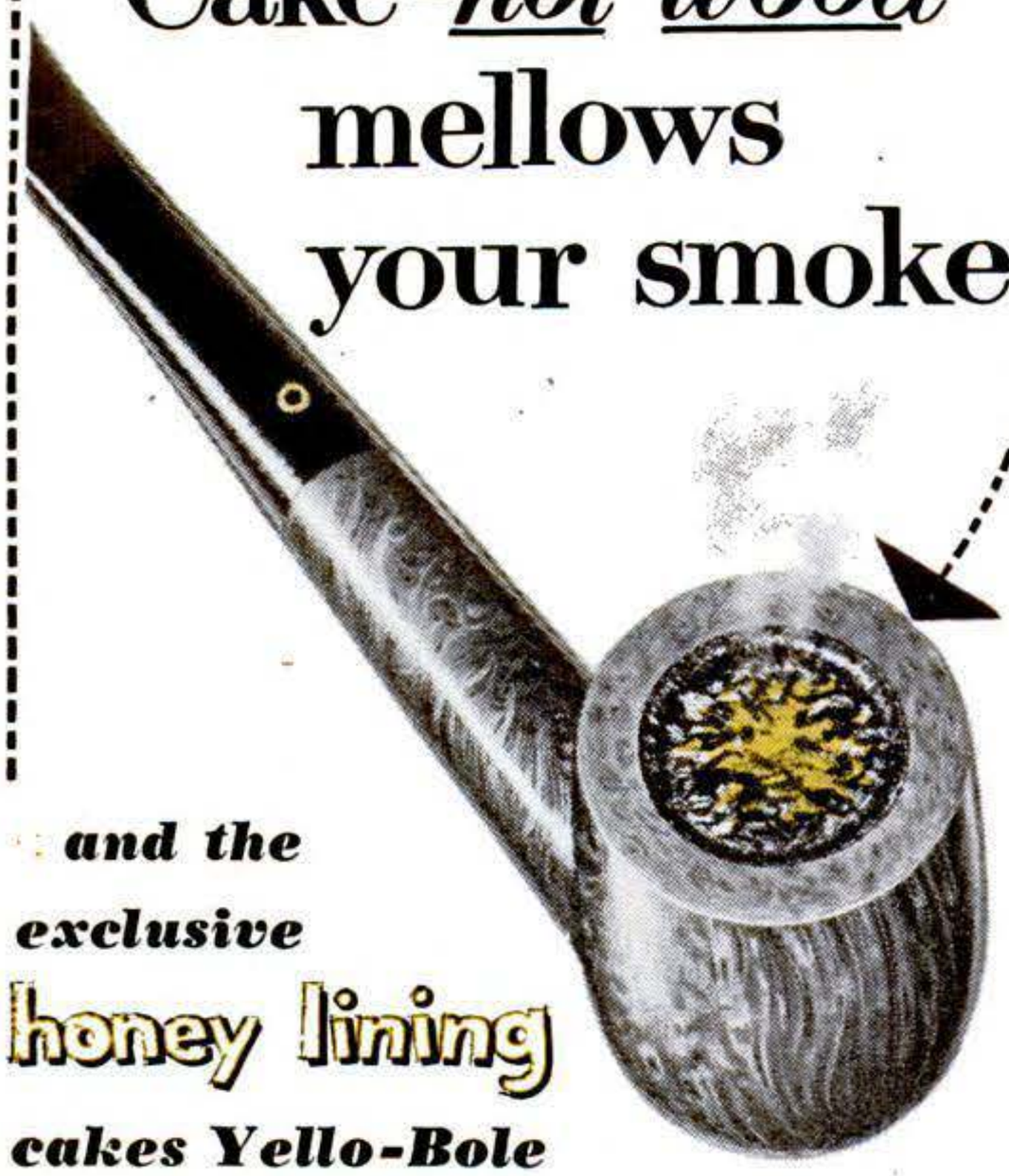
"Cake"-*not wood* mellows your smoke



and the exclusive honey lining *cakes Yello-Bole imported briar far faster than any pipe at any price!*

The yellow in Yello-Bole is real honey —and honey cakes faster! This great Yello-Bole exclusive builds up "cake" from the first puff . . . holds the cake *fast* to fine imported briar. One pipeful—and you're smoking cool and sweet. No break-in. *No tongue sting!* It's the pipe that takes the cake!

PROOF?

Yello-Bole is the world's largest selling pipe . . . BY FAR!

YELLO-BOLE

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as a drawer pull by attaching it with a machine screw. That's not so easy, for every winding key I ever saw has left-hand threads.

LAWRENCE MANLOVE, Richmond, Ind.

Keep looking, because they come both ways. On some clocks, both keys have left-hand threads. On others, one has a left, the other a right-hand thread. PSM clinched the case by turning up one antique on which both time and alarm winding keys have right-hand threads.

Back Talk from Turkey

The article in your July issue on the war against international counterfeiters includes a picture identified as a scene in Ankara,

Turkey. I wish to call your attention to the fact that the photo actually was one of Istanbul.

I have been a reader of your magazine for more than 15 years.

V. L. PAPADOPULOS, Istanbul, Turkey.

You are right about the picture. It shows a scene on the waterfront near Yeni-Cami Mosque in Istanbul.

Front vs. Rear (Cont.)

In your Letters column of September Mr. Prows states that he would "put the engine in the rear so it wouldn't come crashing through the fire wall" in case of a collision.

I'd think it would be *more* apt to come crashing through if it were placed in back. Or do you think he's talking about collisions in the rear?

DAVID ANDERSON, Beaumont, Calif.

We think he was talking about front-end collisions. And the question—which we won't try to settle—is whether an engine is more likely to be pushed back into the driver's

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INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

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A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

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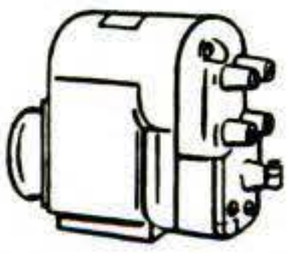

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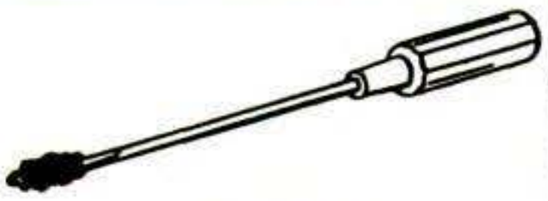

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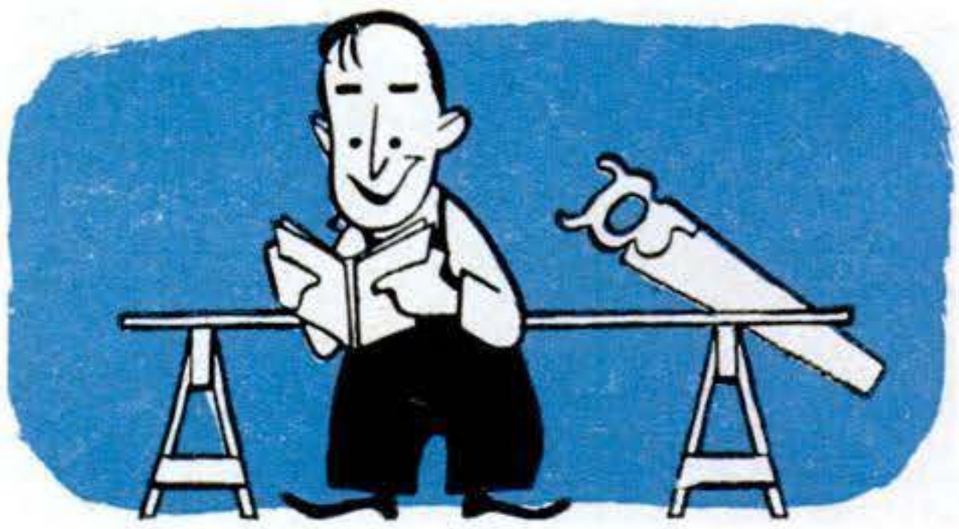
lap or thrown forward against the driver's back.

Who's Nuts?

You have a swell magazine—keep it that way. You seem to know just when I have a certain project on the fire, for you always



come up with an article on the subject just when I need it most.

My wife says I am nuts because I start looking at a magazine from the back. Maybe you can help me find out if other people do too.

RALPH C. FINN, Northampton, Mass.

Thanks, maybe even more readers would enjoy the magazine if they read it Mr. Finn's way.

Coast to Coast: $15.52

Wilbur Shaw drove a Mercedes diesel and wrote about it in your June issue. I have owned one of these cars since June, 1952, and just finished a coast-to-coast trip and return with it. The trip was trouble-free and took six days to the coast. We kept a record of the trip just to see how close Mr. Shaw was with his statement that this car "will chug from New York to Los Angeles on $12 worth of fuel." He was very close indeed, as you will see from my actual figures: mileage, 3,124; diesel fuel, 71 gallons; cost $15.52.

F. ROTH, NYC.

Who Made a Boner—Or Did They?

PSM has pulled the most colossal boner of all time, in my opinion. Browsing through an old Feb. '36 issue, I noticed an article which stated that a scientist had produced six compounds from an inert gas, argon. . . I checked in many of the latest chemistry textbooks and found they claimed no combination of this element was possible. . .

GUY DAVID MANGUS JR., Baltimore.

The chemists are still arguing. They believed "noble" gases like argon formed no

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INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

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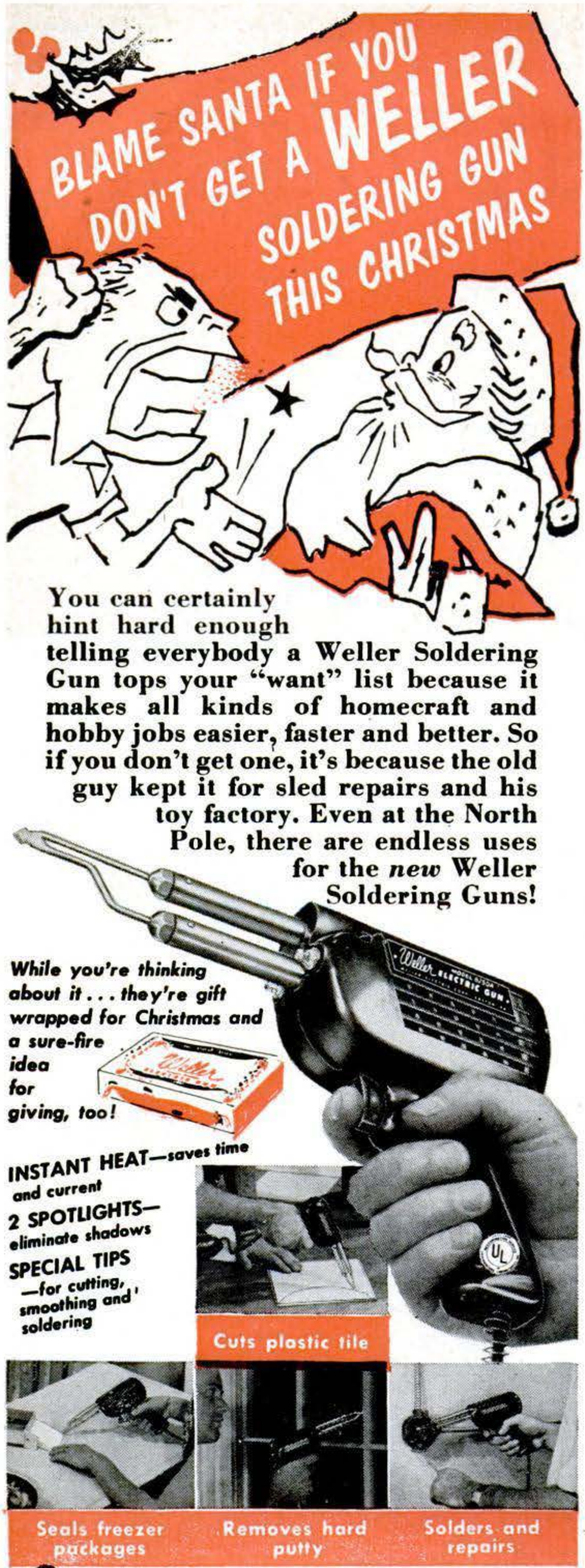


chemical compounds, until Booth and Willson told of producing several, as reported both in the authoritative Journal of the American Chemical Society *and in PSM. Other chemists later repeated the experiments, disputed the evidence for argon compounds; but a recent report of two Brookhaven National Laboratory scientists supports it. They bubbled argon gas through an extremely cold (–321° F.) solution of boron trichloride in liquid propane, eyed a resulting precipitate, cautiously opined it "suggested that argon enters into compounds . . . somewhat as Booth and Willson had found. . ."*

Flying Saucer Hits 35 M.P.H.

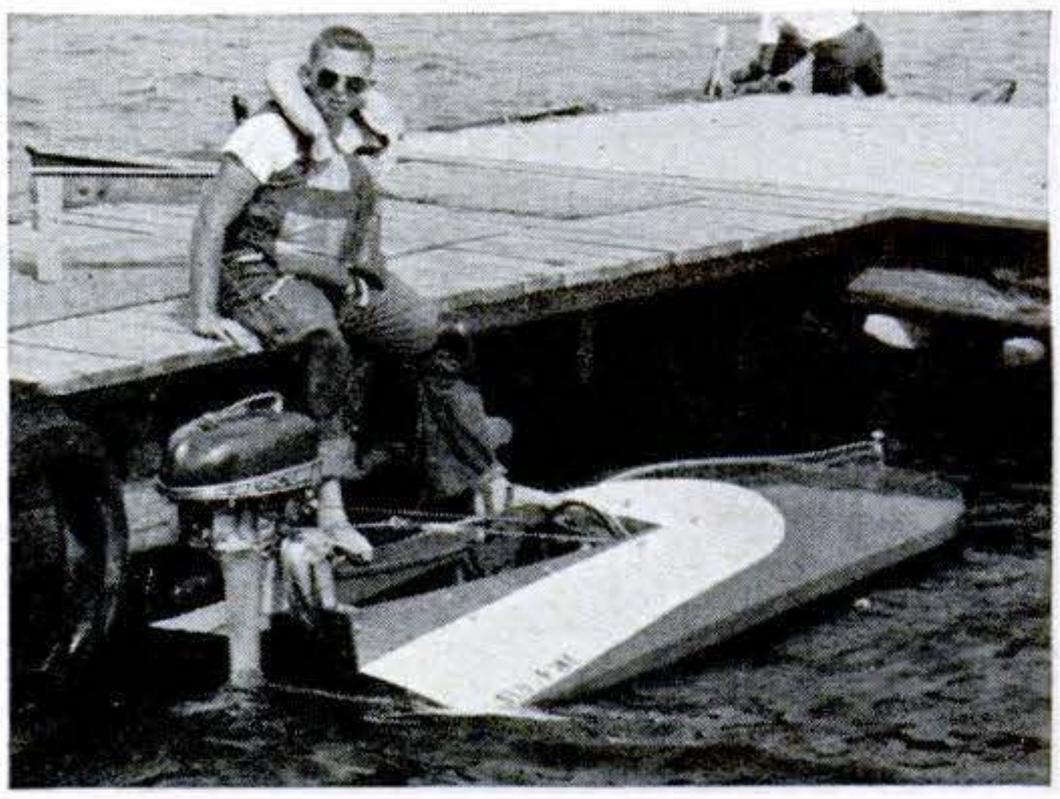
I am enclosing a snapshot of the Flying Saucer I built from plans you printed back in February, 1951, which I found to be very complete and easy to follow.

I used a 7½-hp. Mercury motor added a "rev stick" and attained 32 m.p.h., which is slightly faster than the speed predicted by Mr. Rogers.

Using brass screws throughout and ¼" marine ply, the bill came to $62. It was well worth it. It took me a month and a half with a power saw and drill.

After running a couple of weeks, I decided to hop it up and bought a Michigan racing propeller. This boosted my speed to 35 m.p.h., which is really moving with a stock motor.

That's me sitting on the dock, holding the boat. I found it better to wear kneeling pads



than to use cushions. As you can see, I am pretty big—175 lb.—but I fit perfectly in the cockpit.

I race the boat at Lake Hopatcong, N.J. I never flipped in it yet but I expect to, as I usually flip in hydros.

E. George Kaplan, Brooklyn, N.Y.

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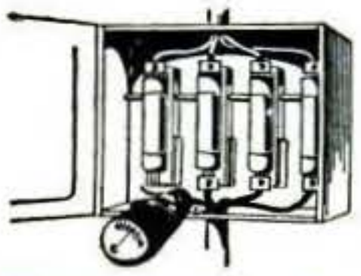

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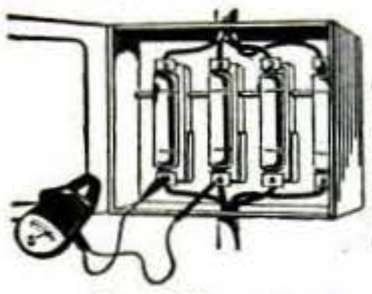

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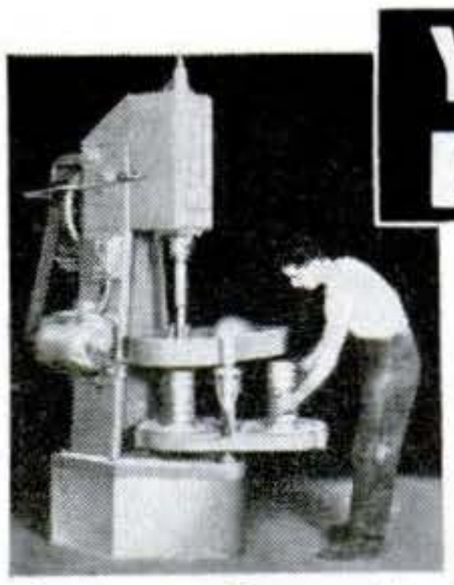

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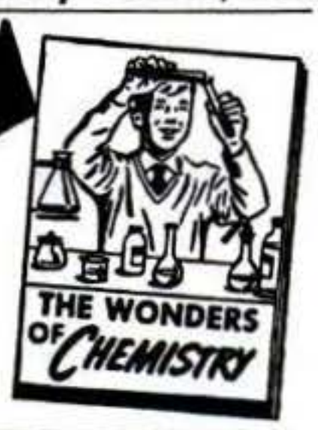

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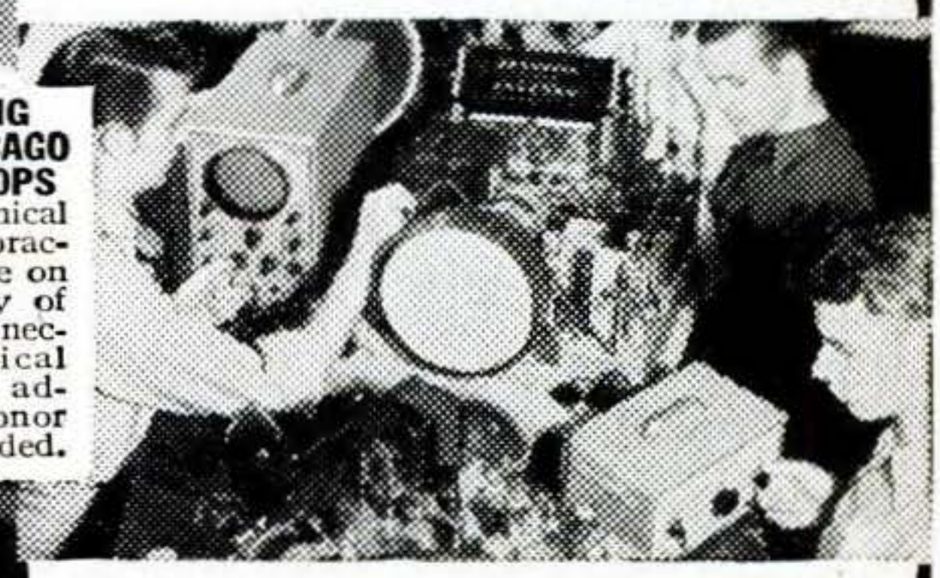

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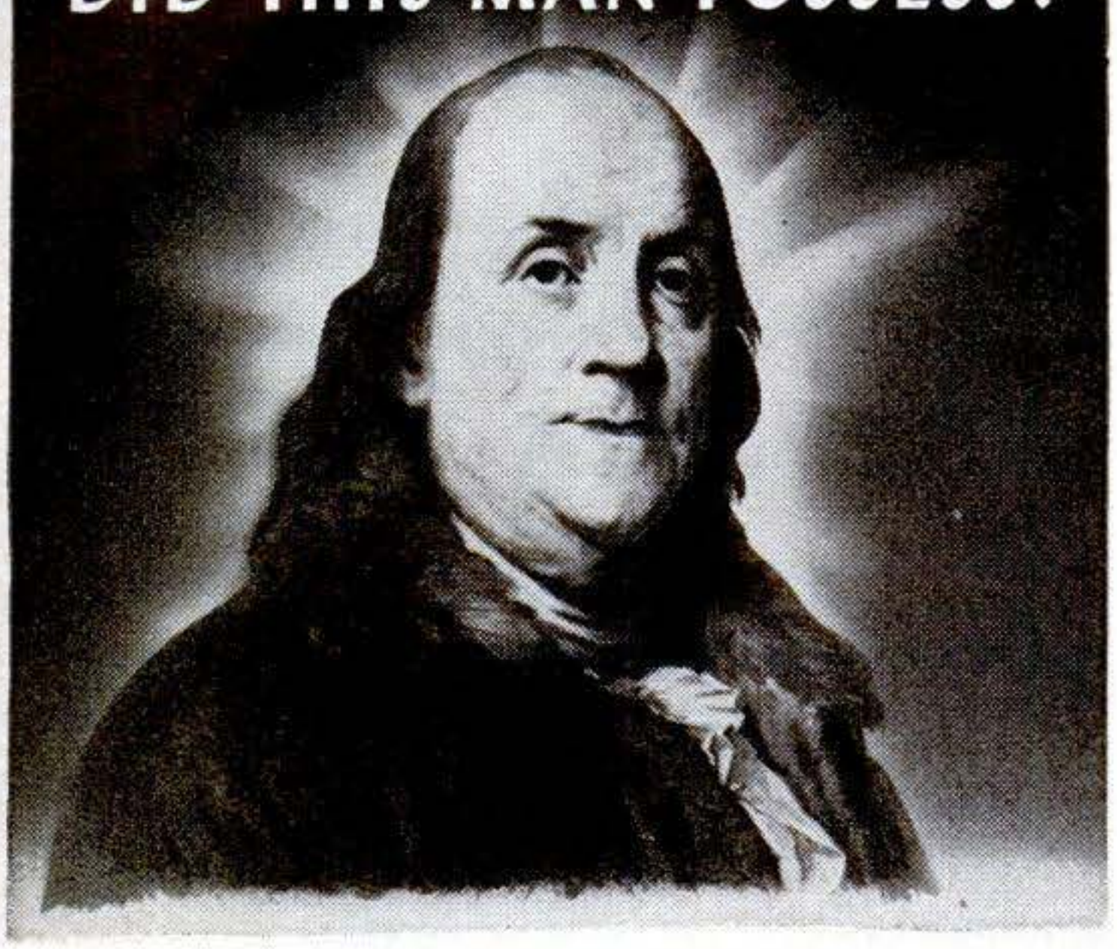

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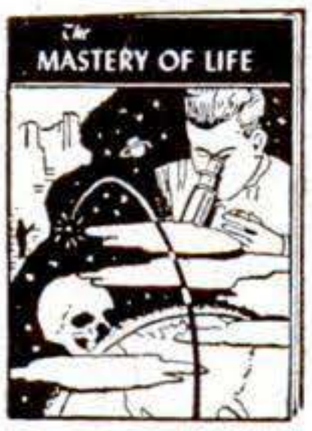

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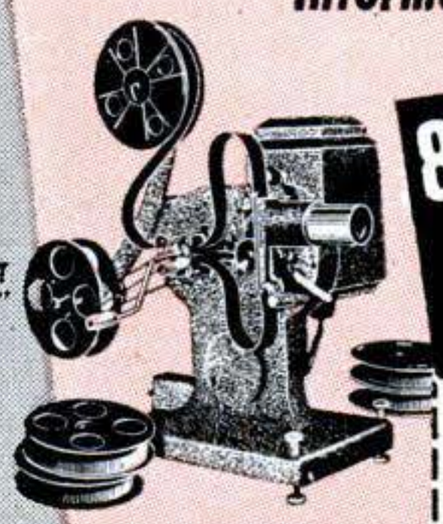

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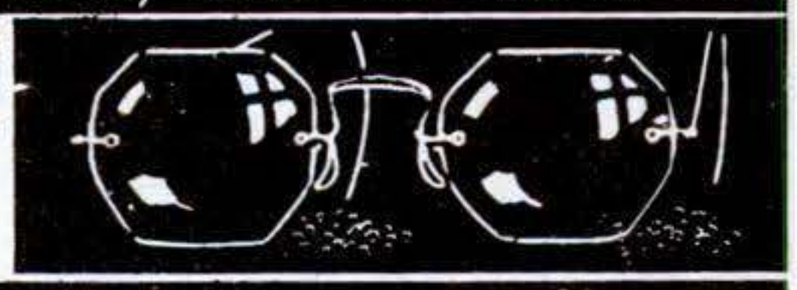

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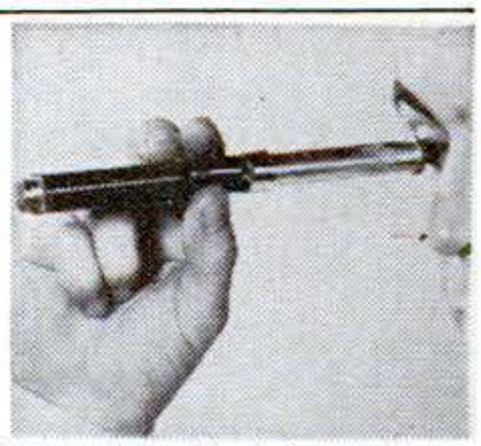

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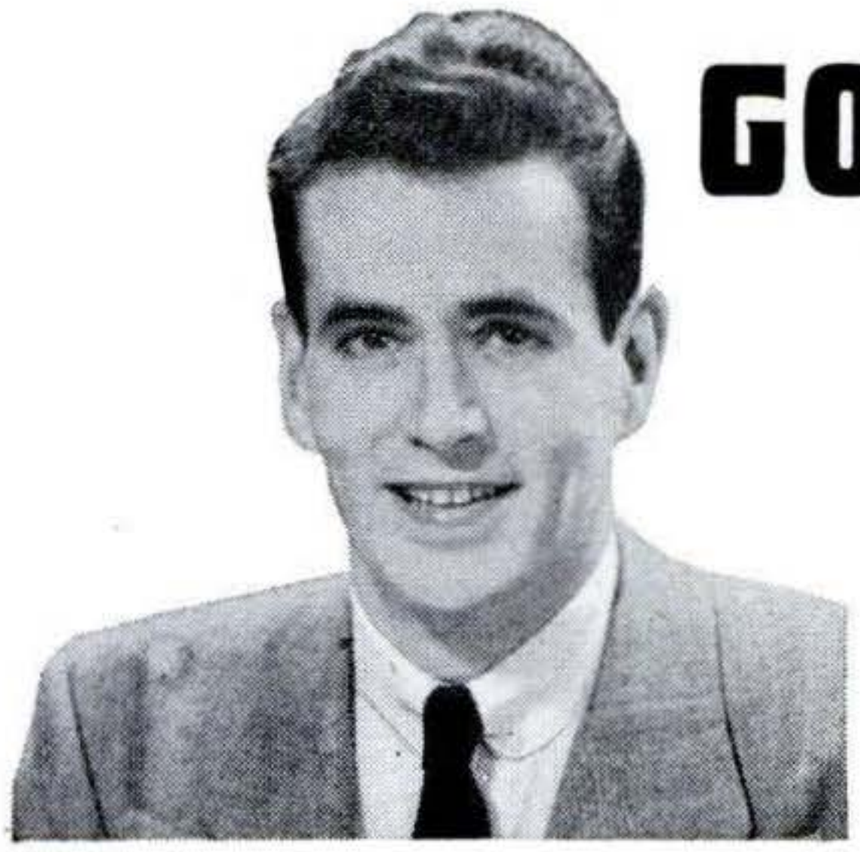

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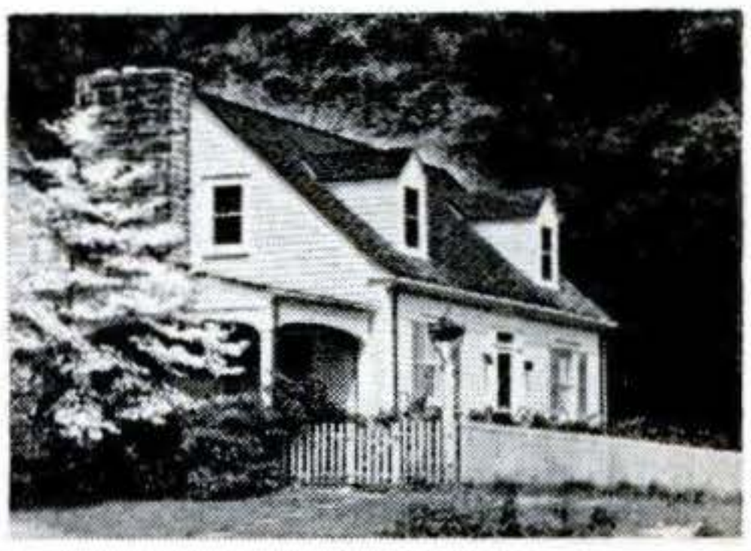

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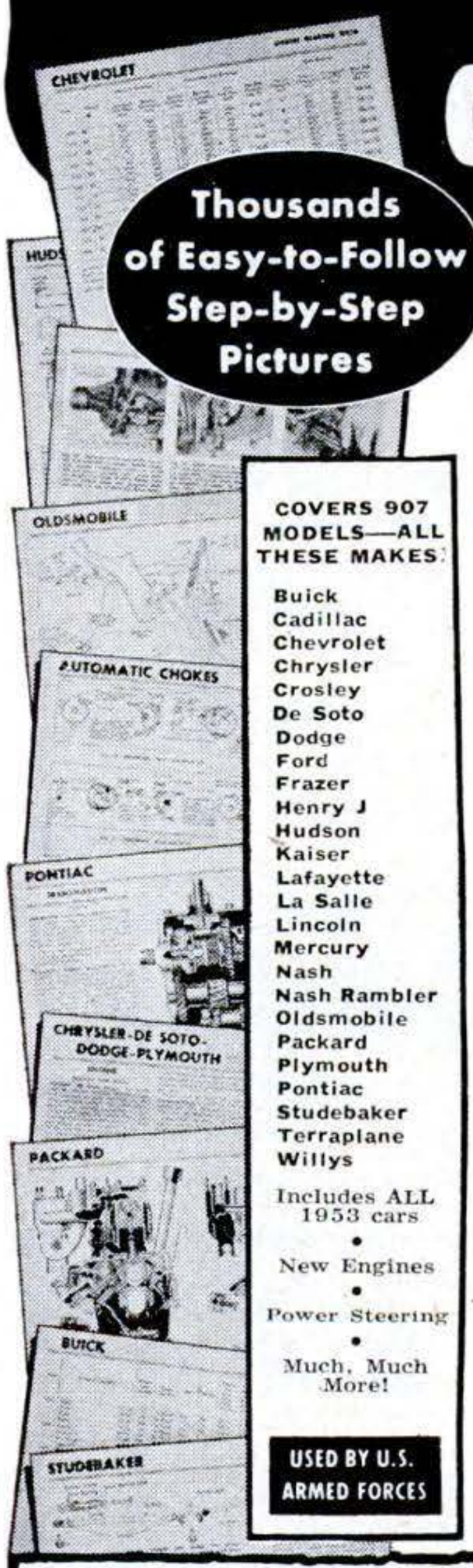

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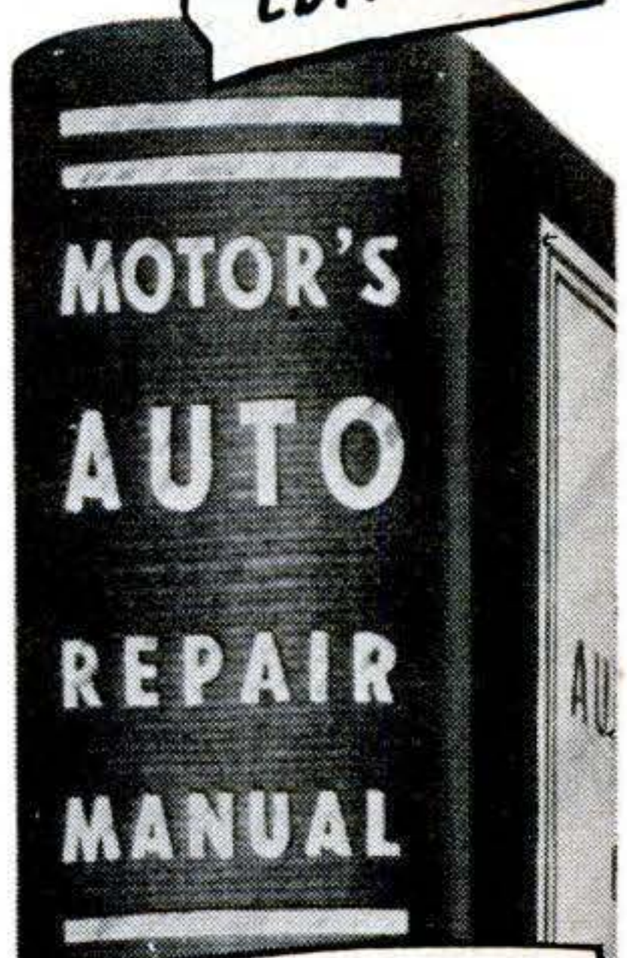

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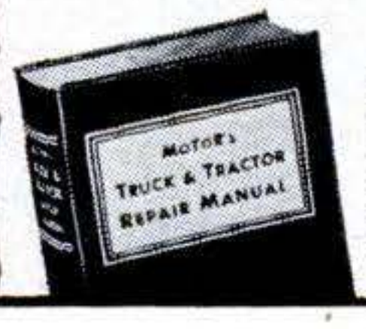

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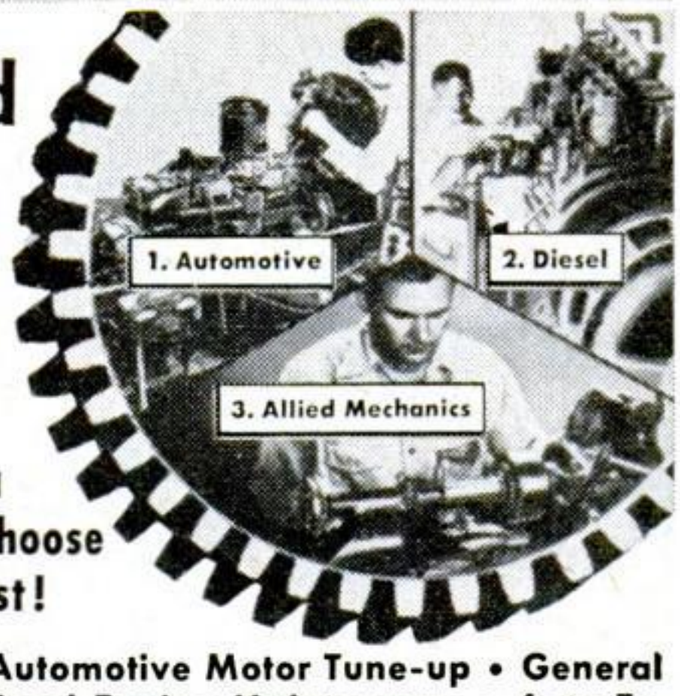

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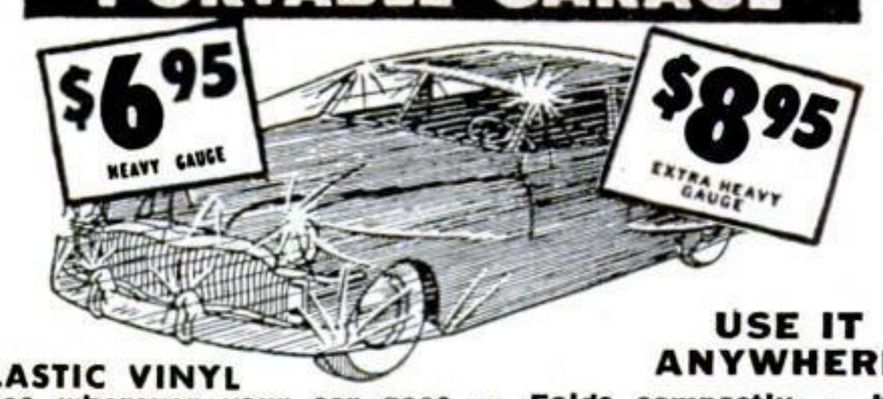

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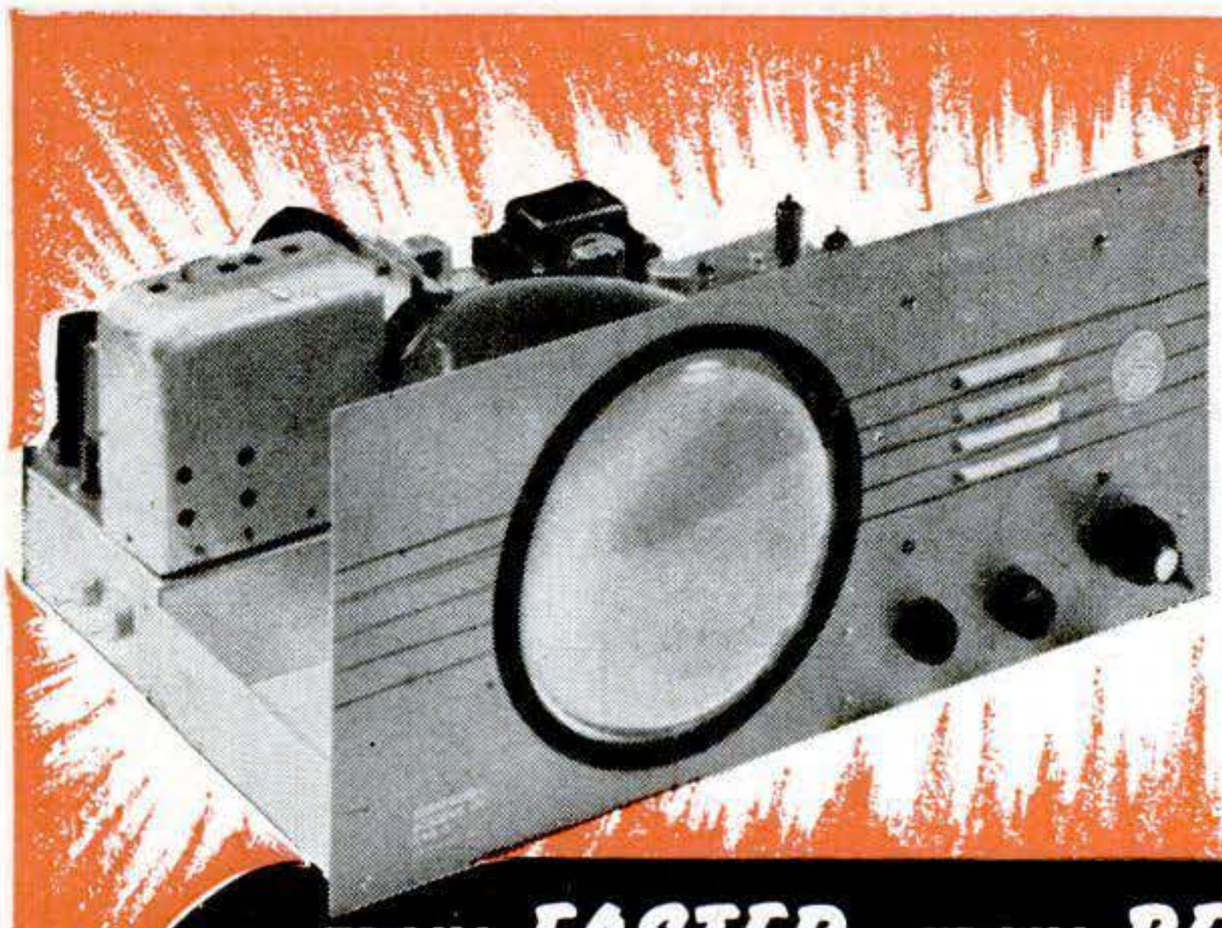

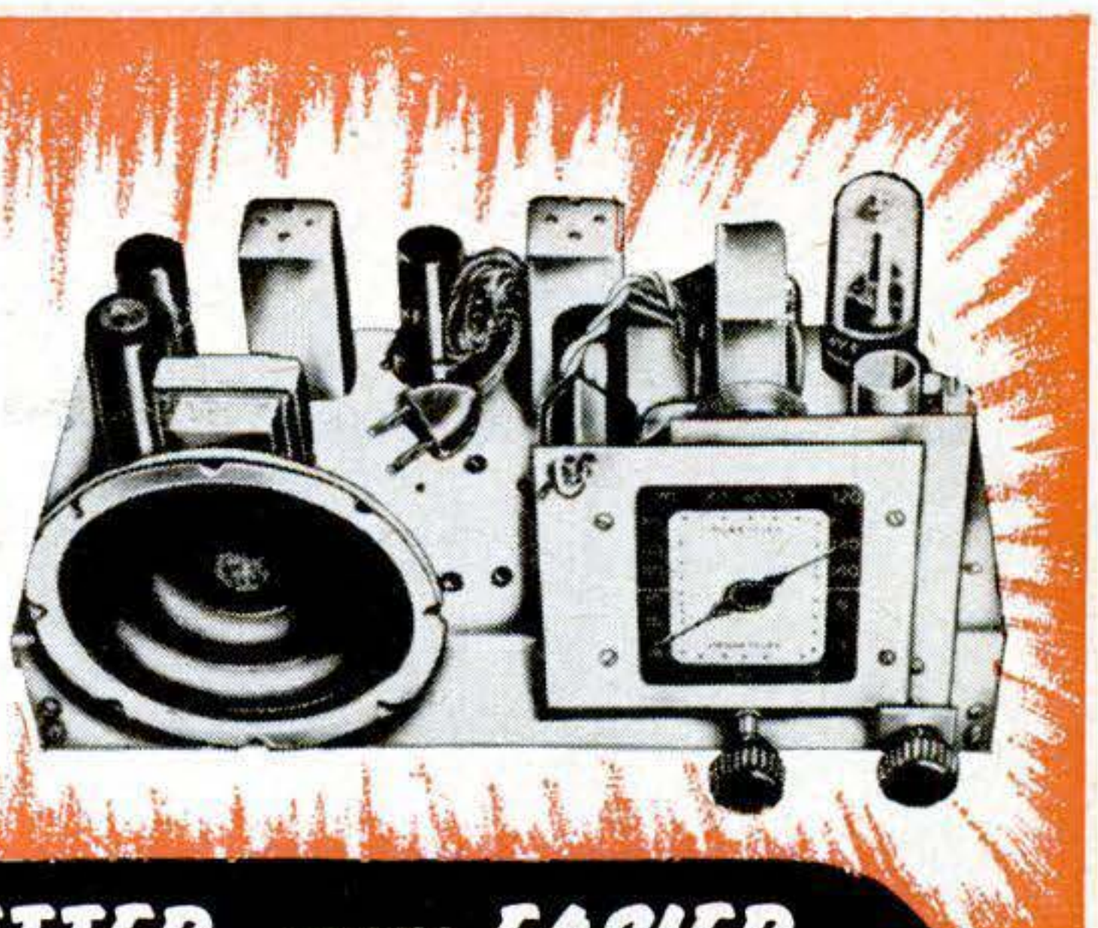

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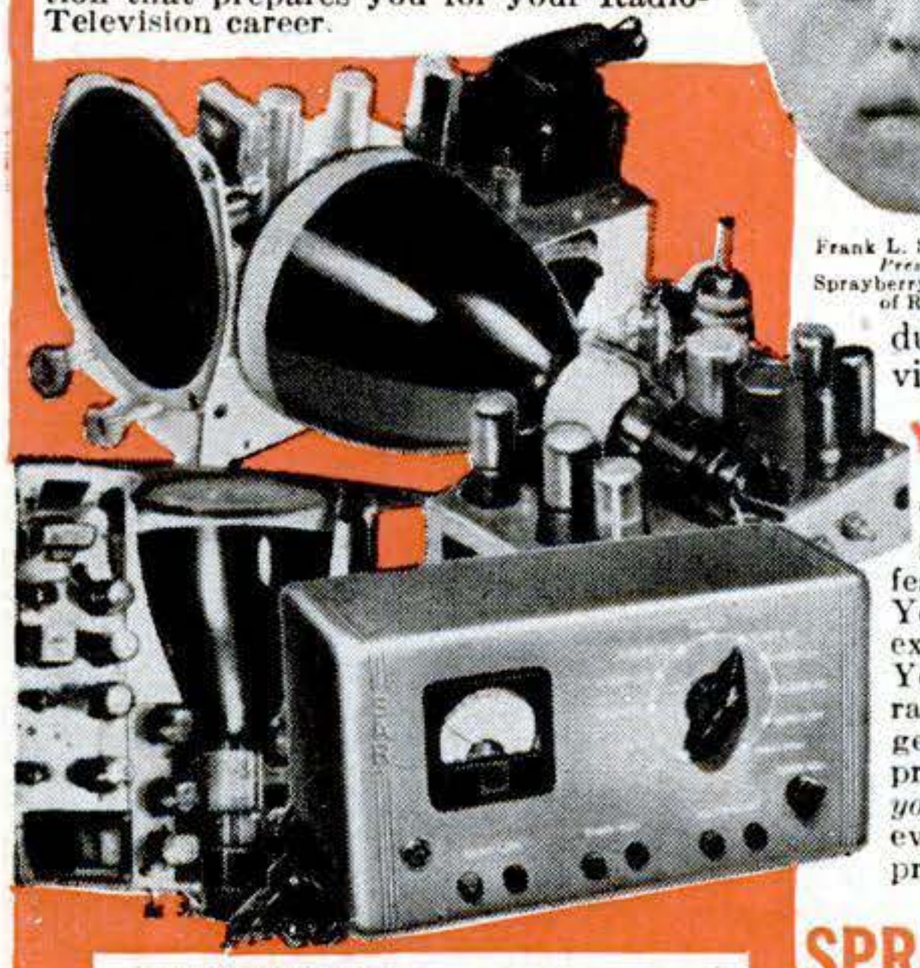

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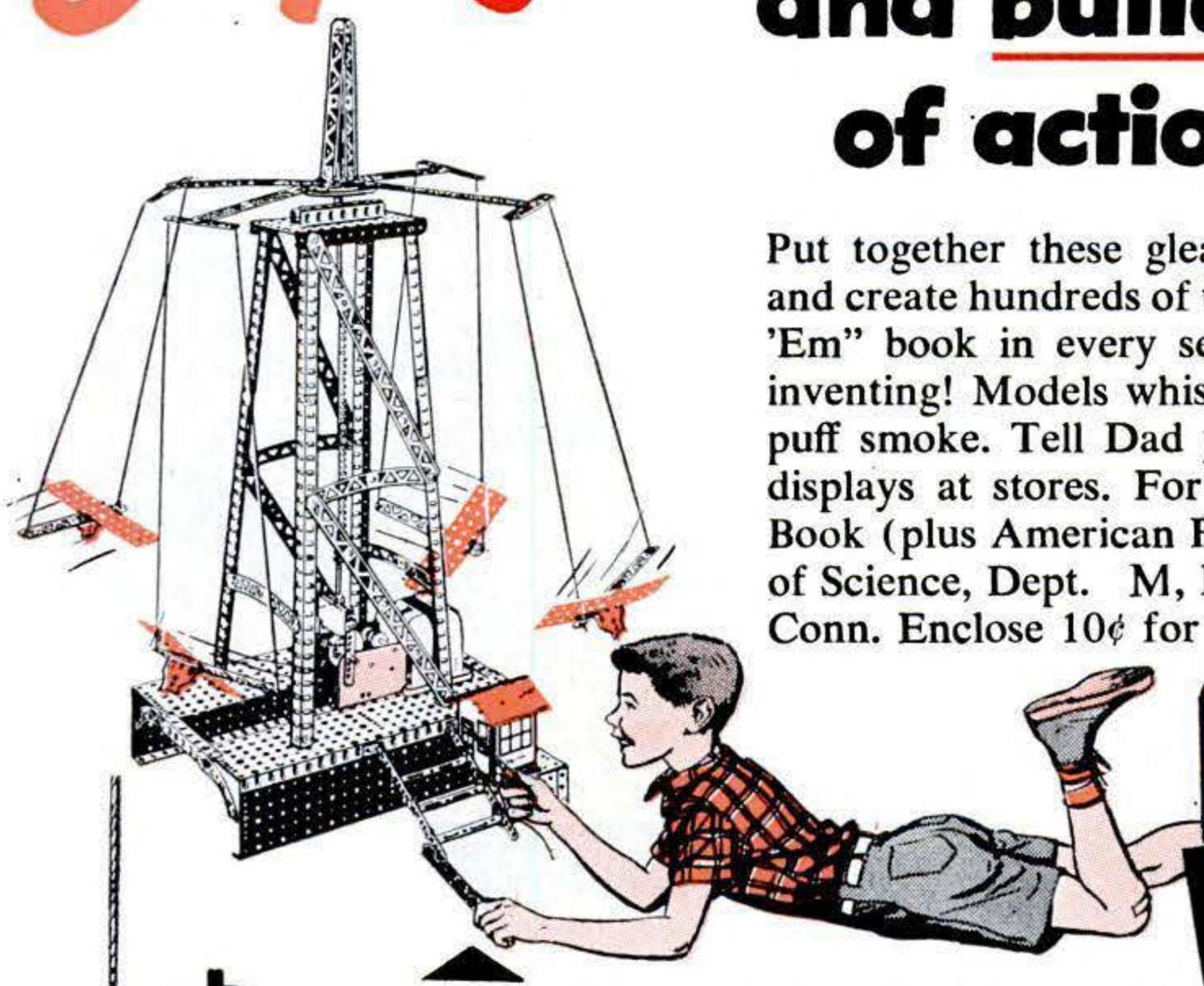

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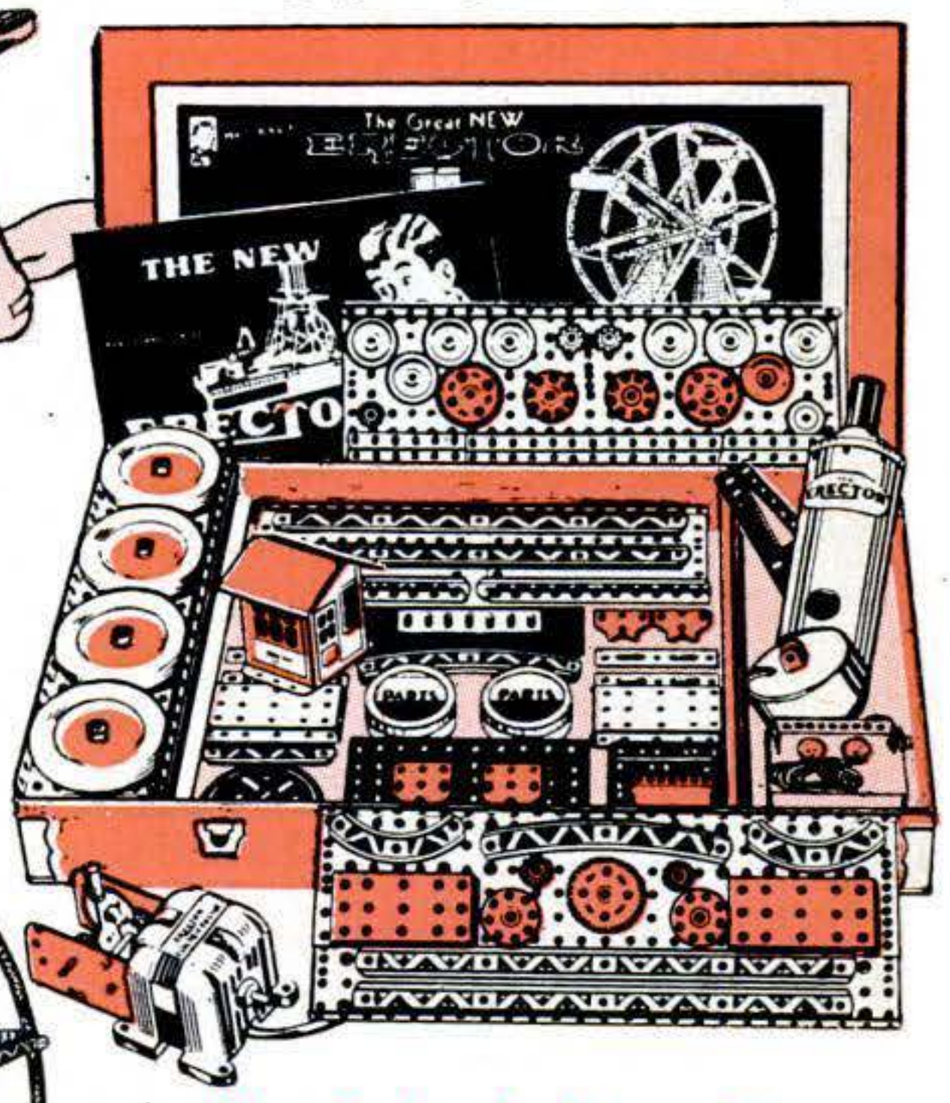

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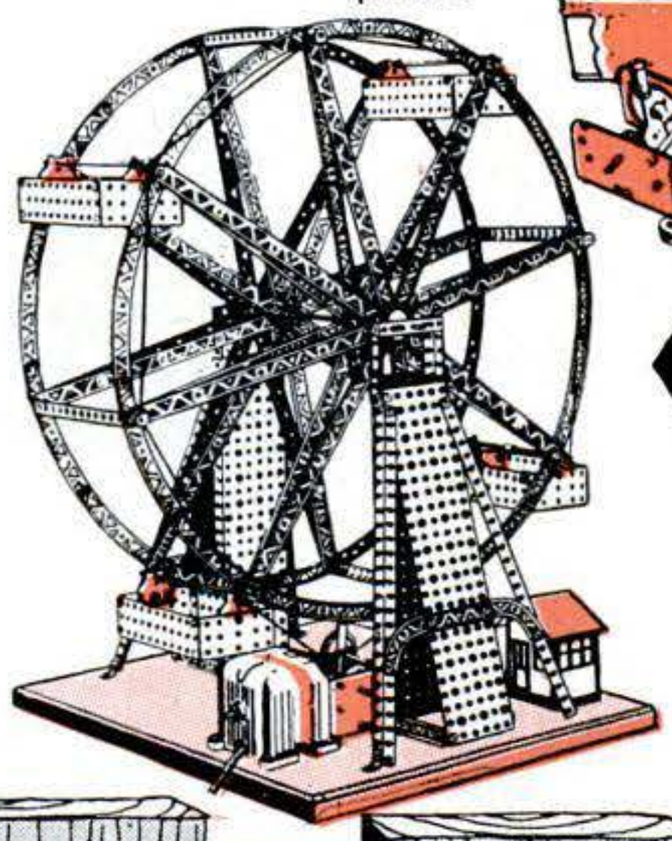

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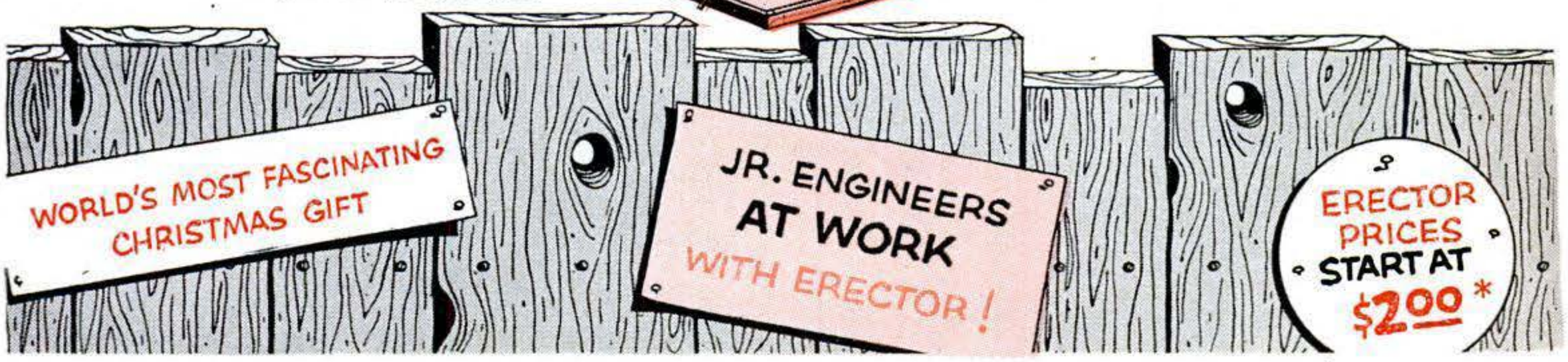

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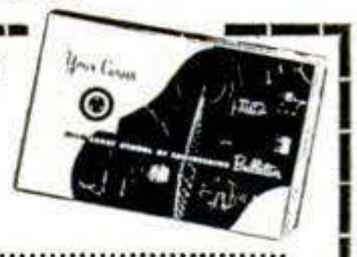

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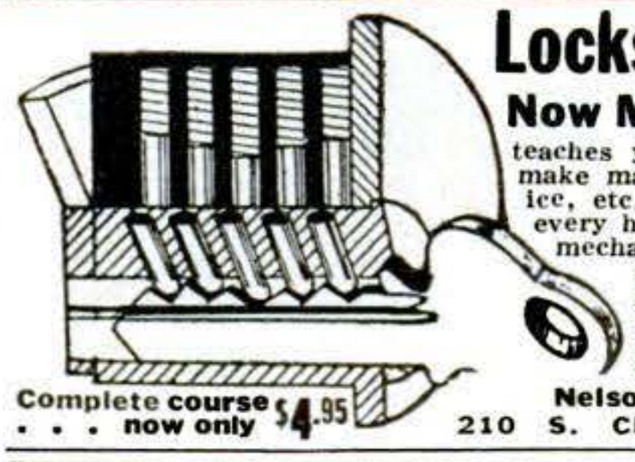

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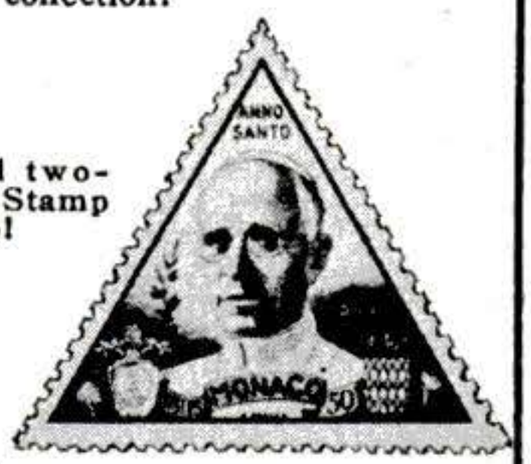

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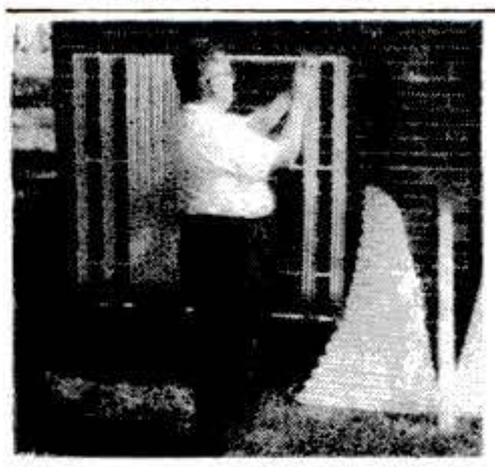

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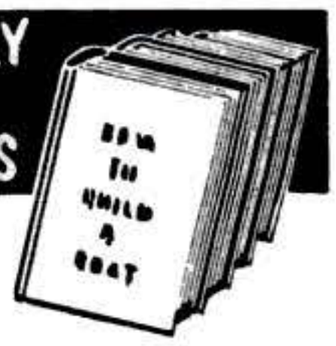

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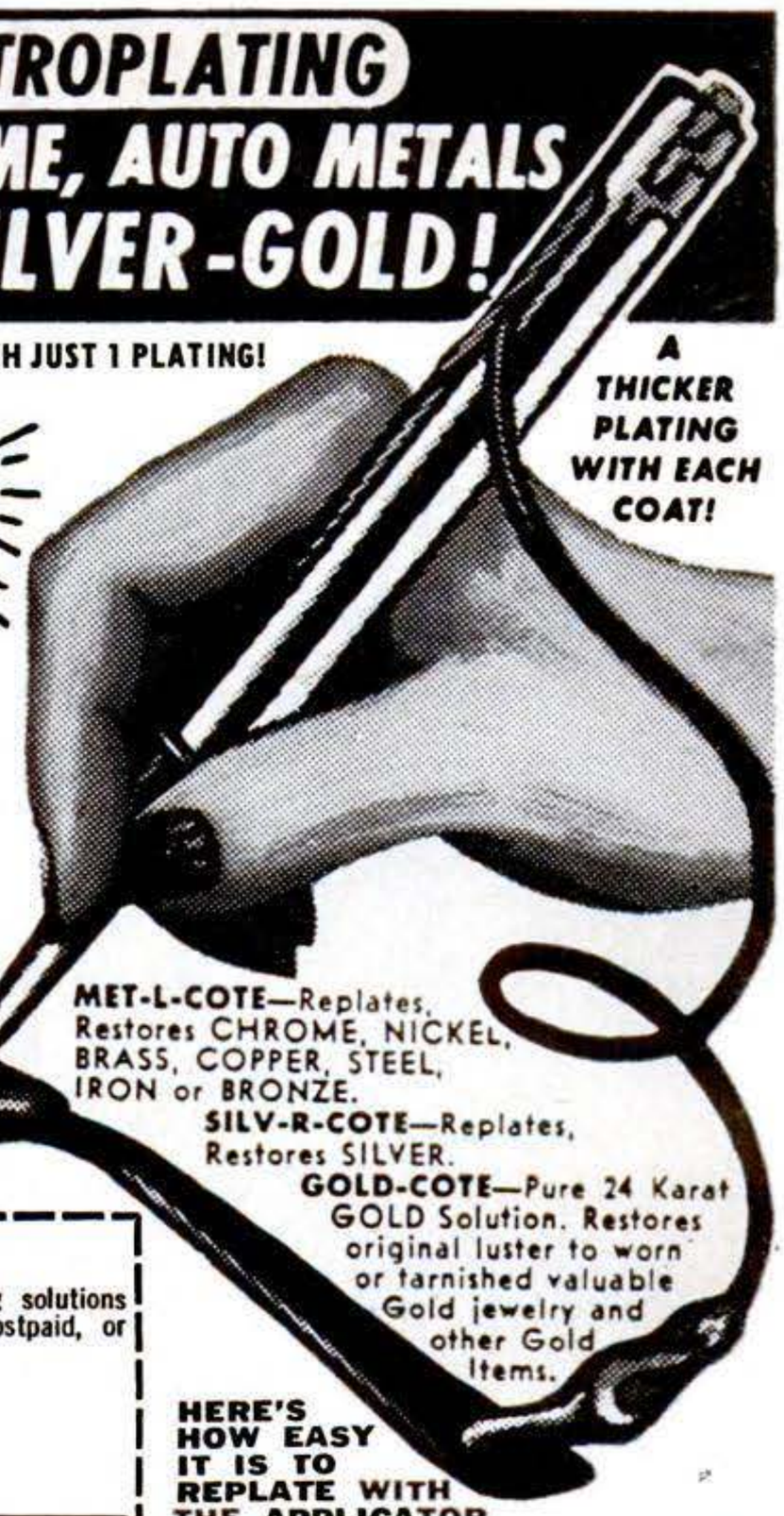

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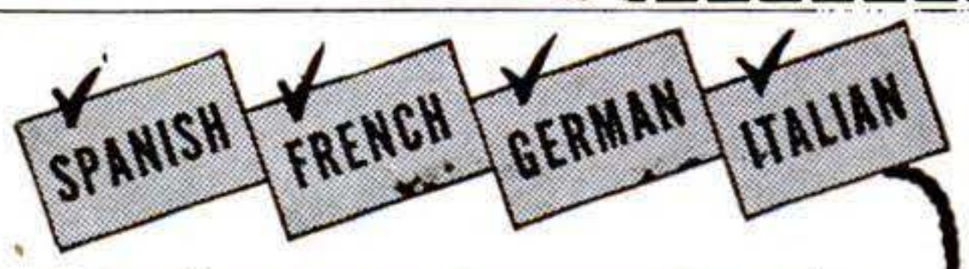

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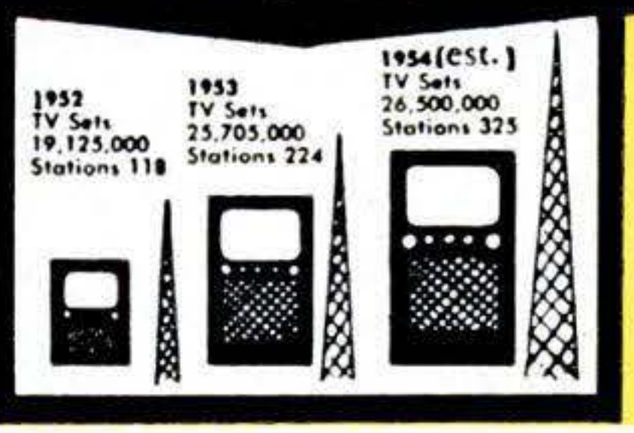

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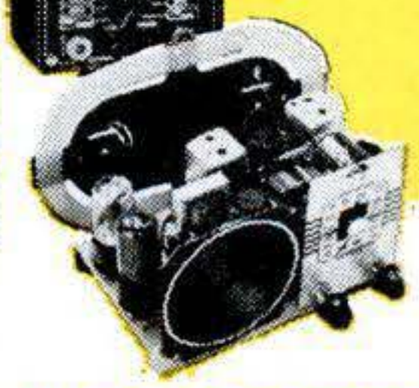

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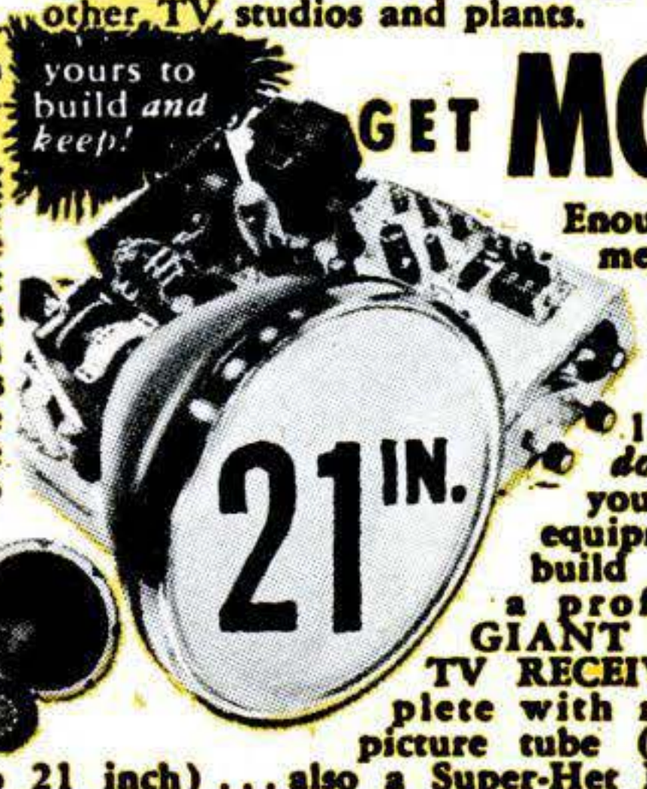

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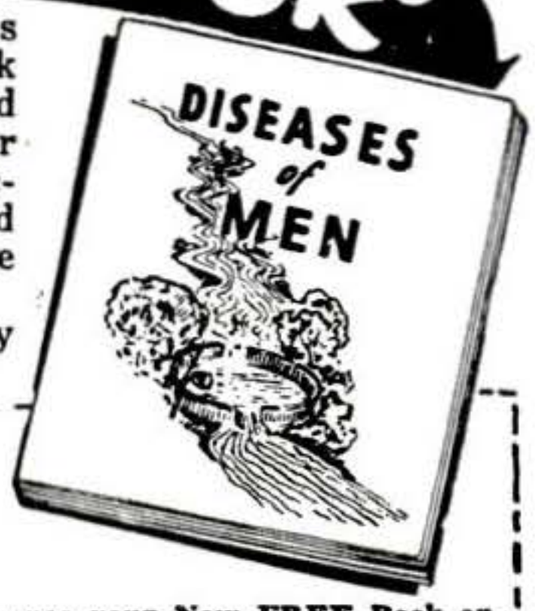

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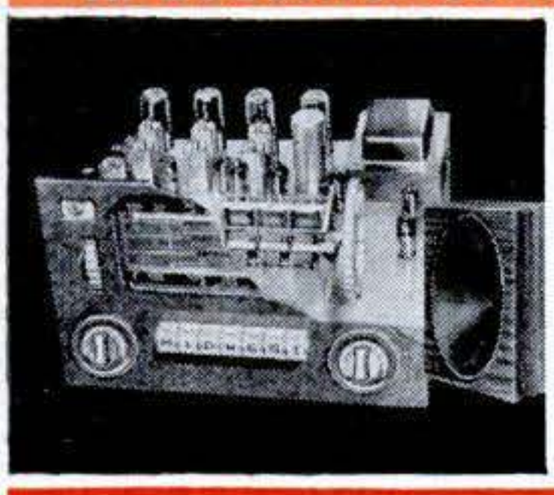

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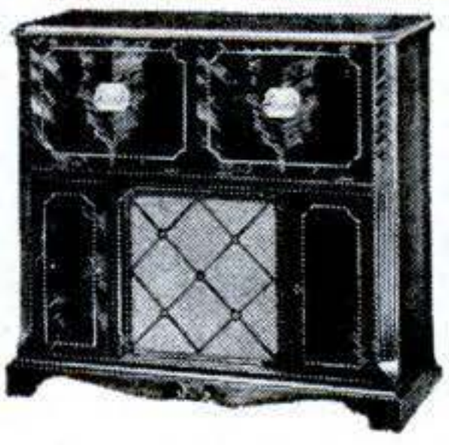

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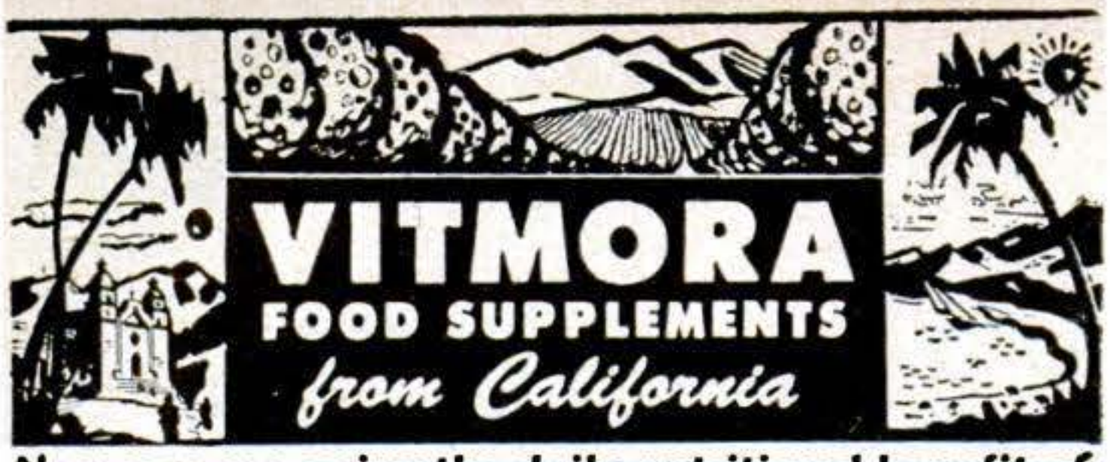

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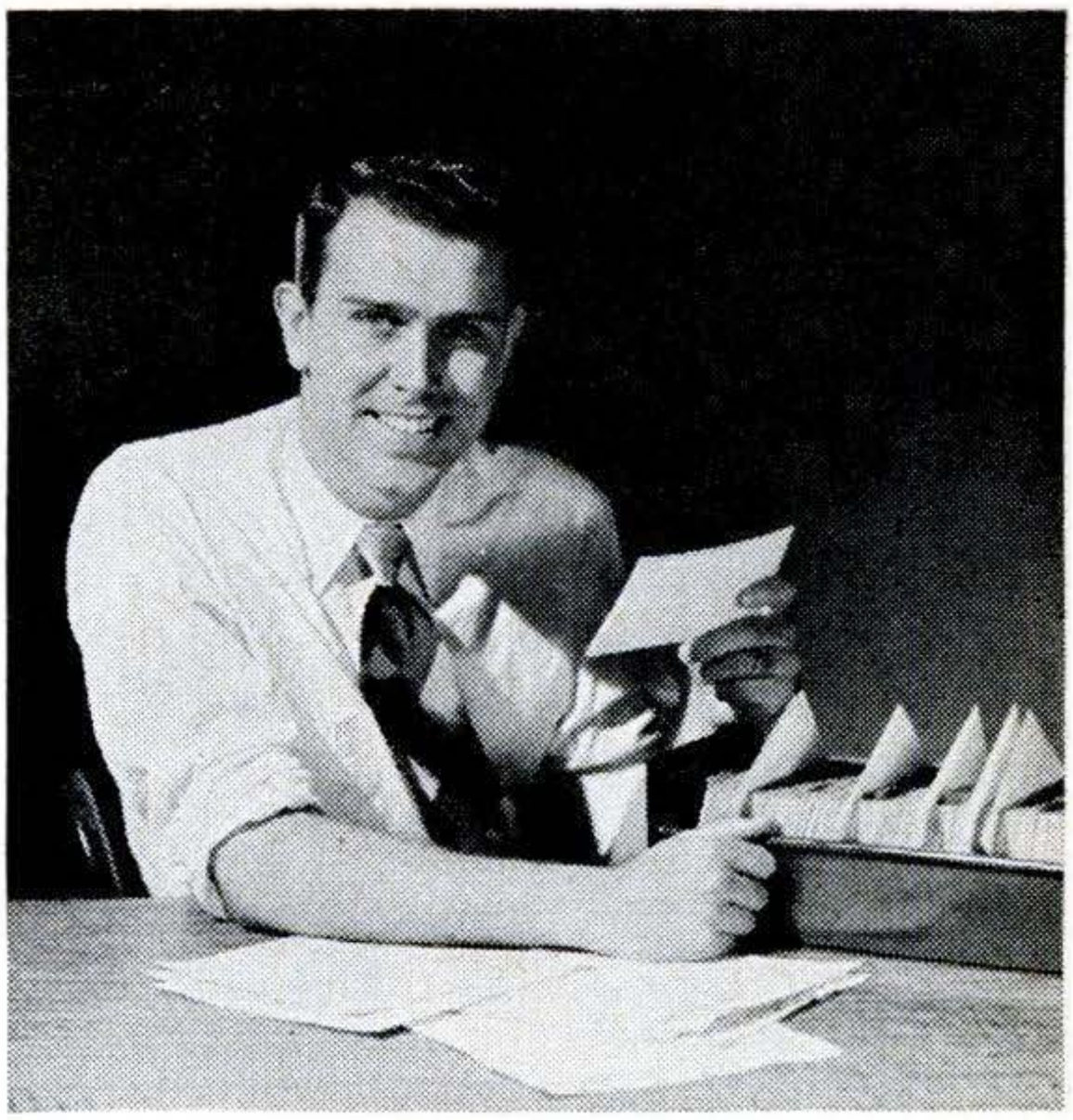

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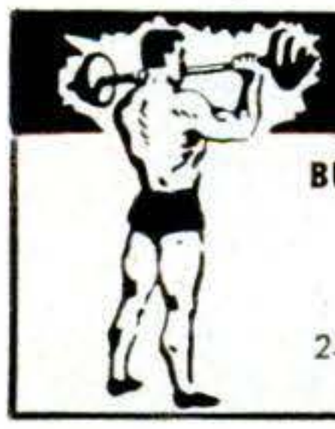

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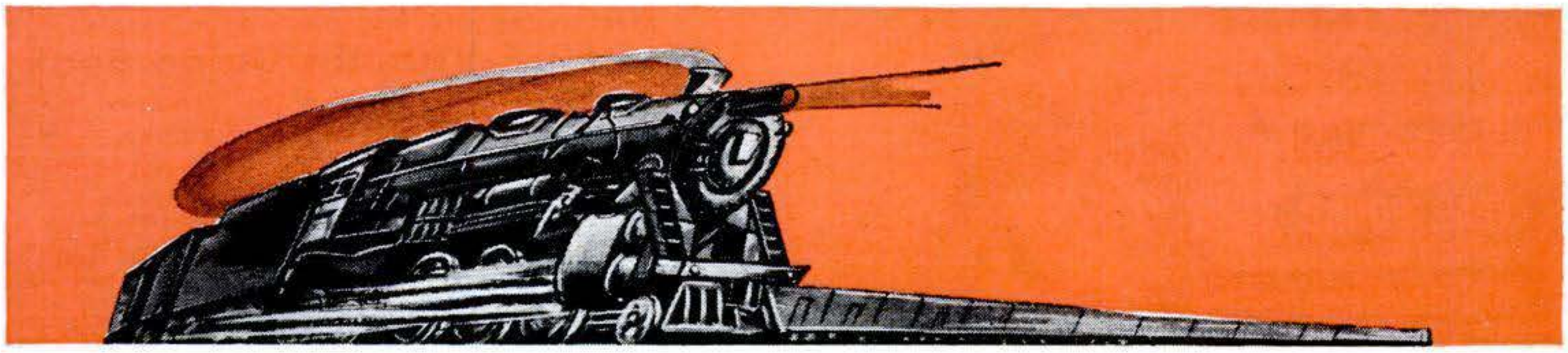

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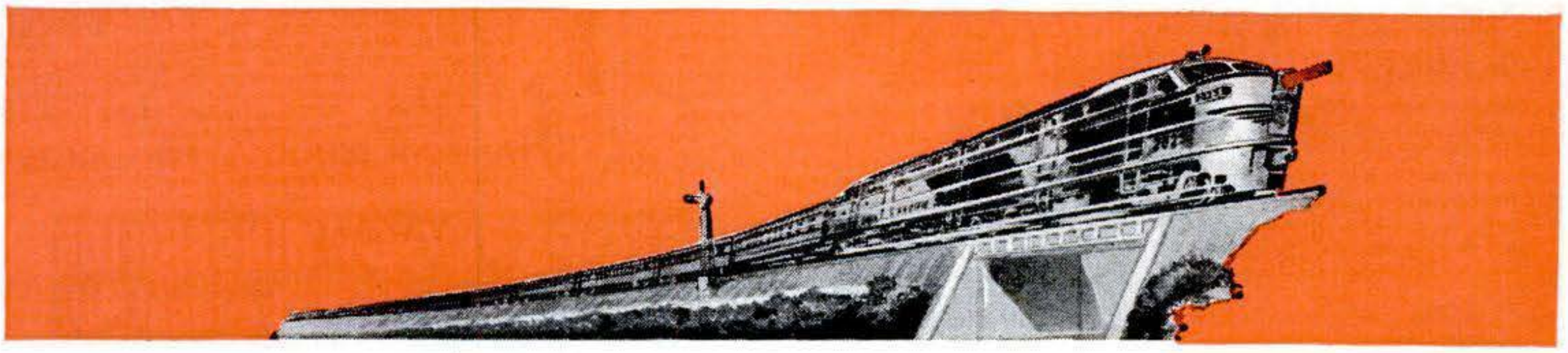

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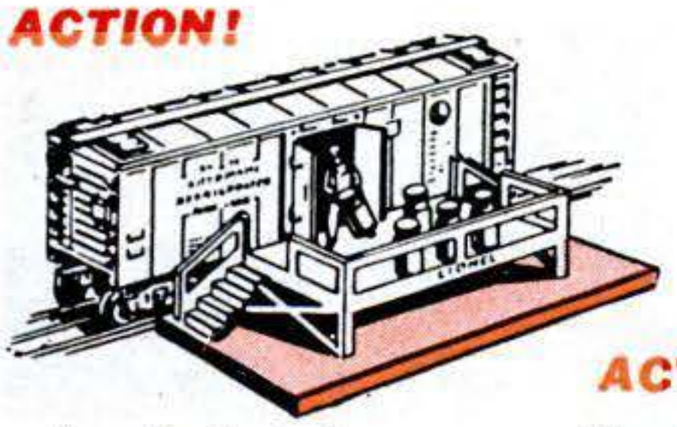

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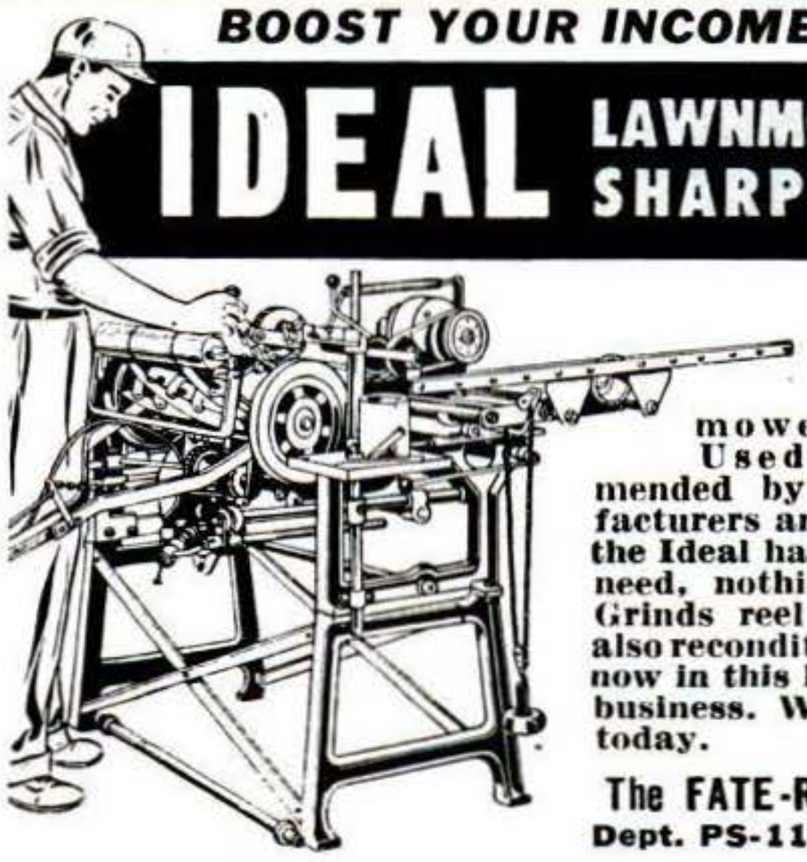

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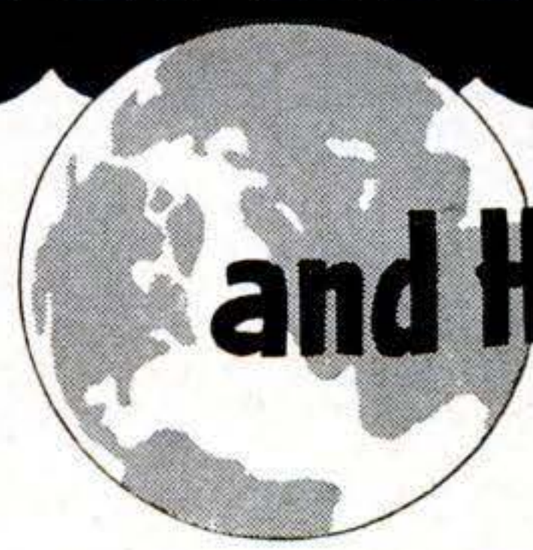

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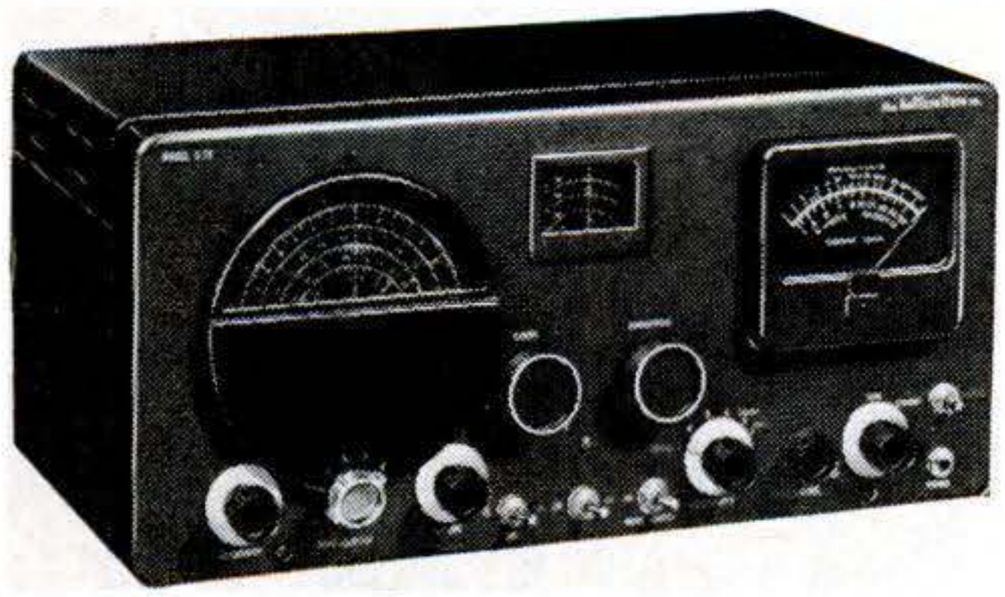

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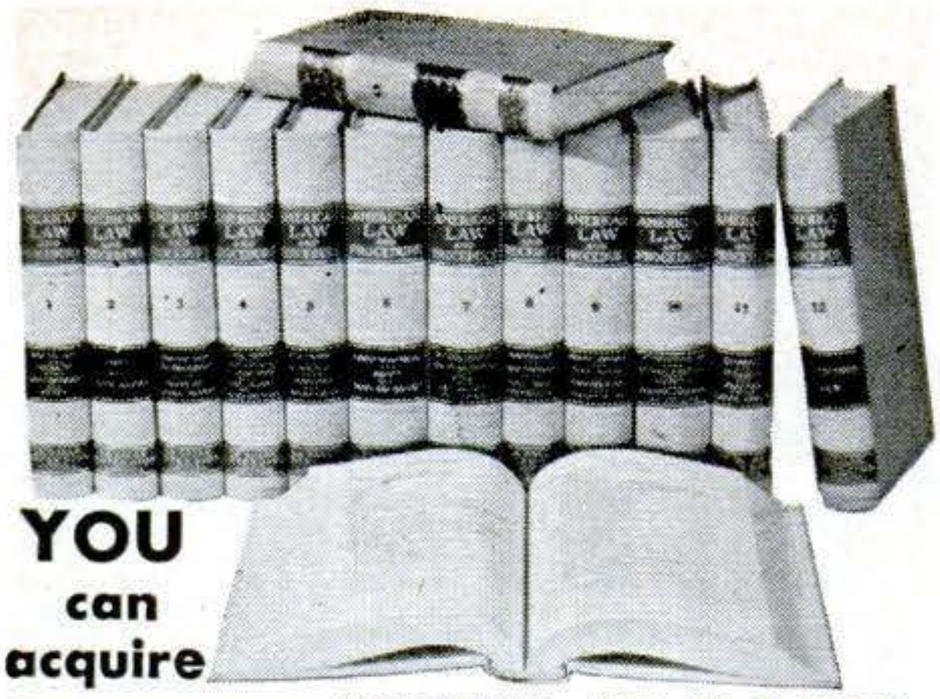

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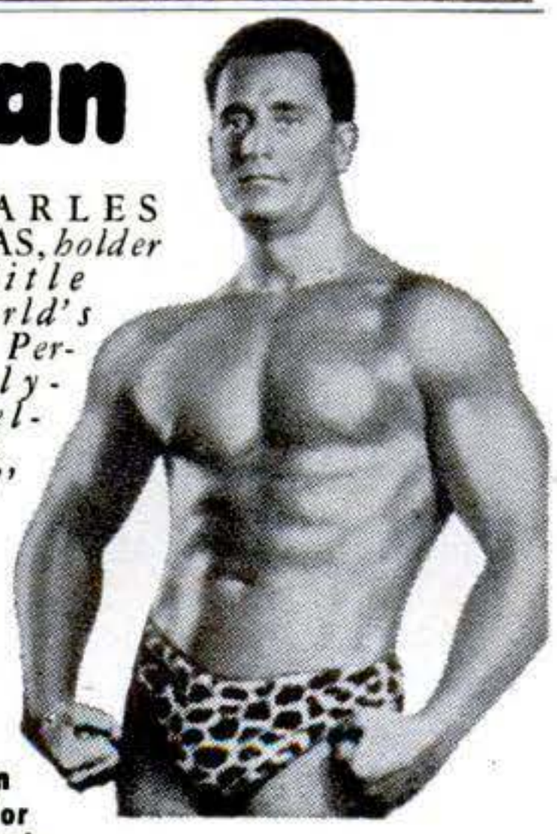

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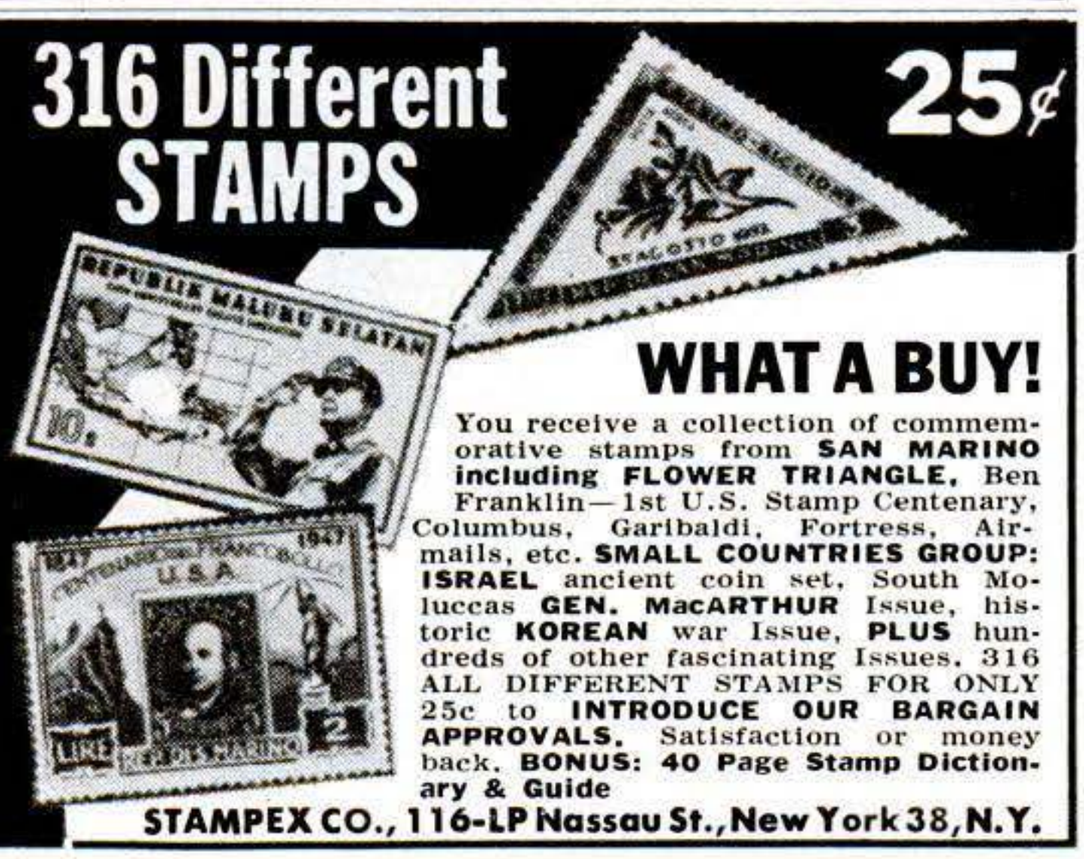

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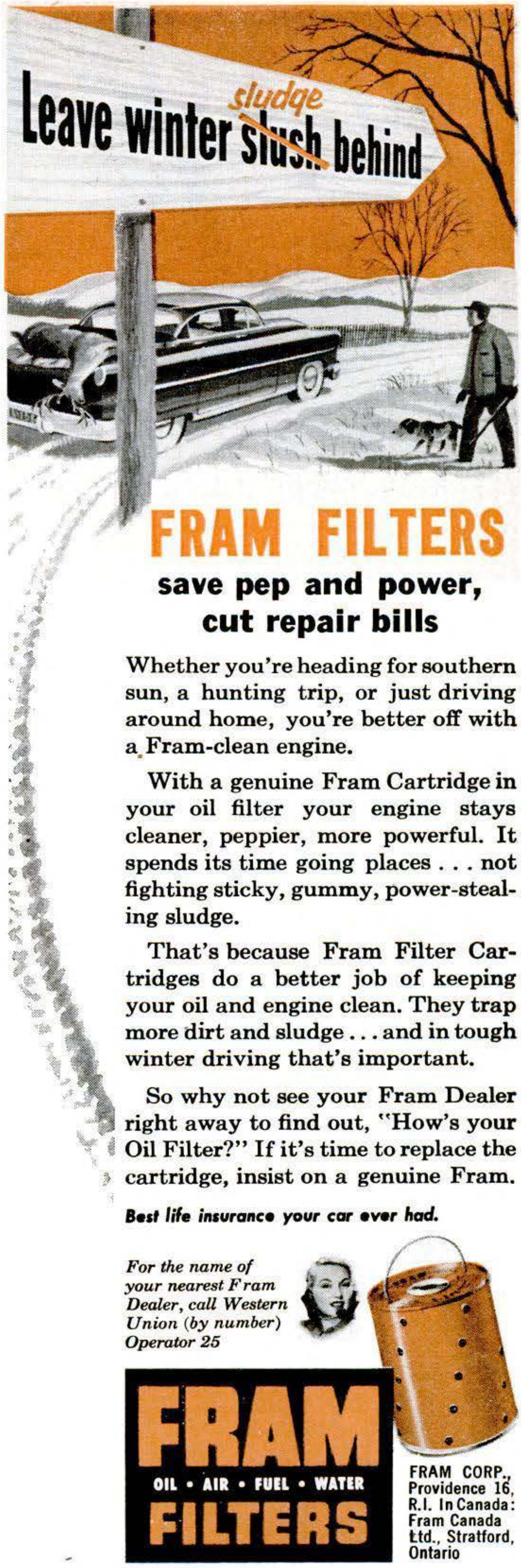

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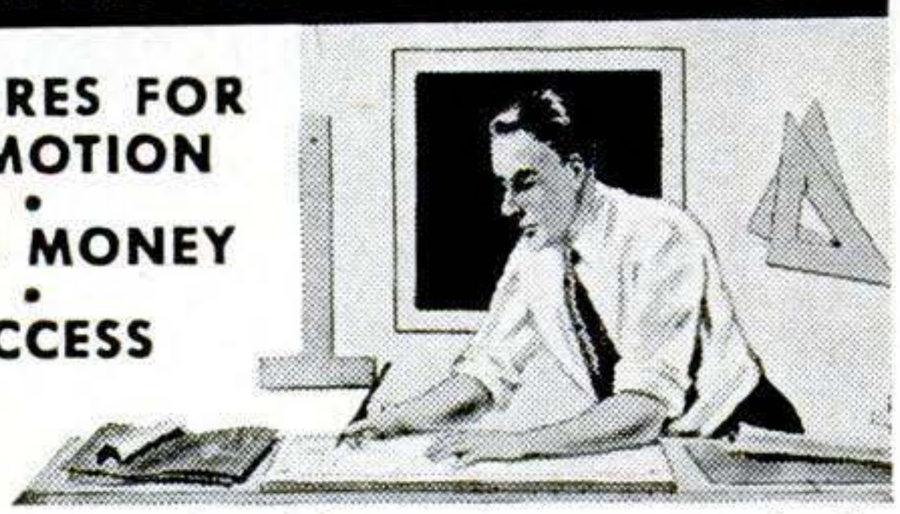

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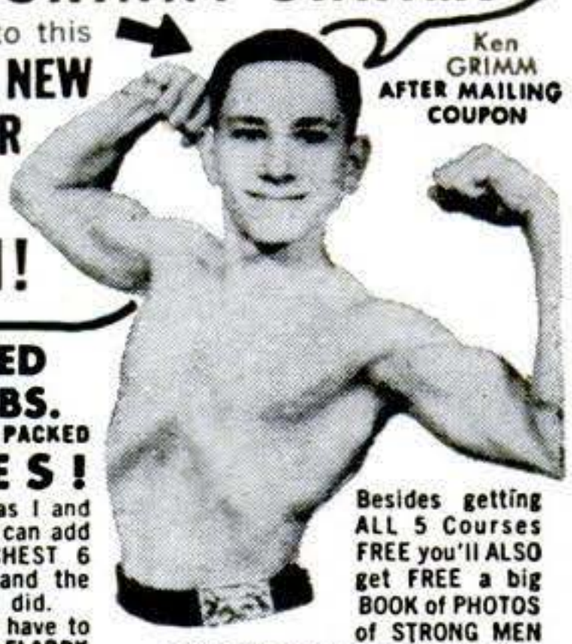

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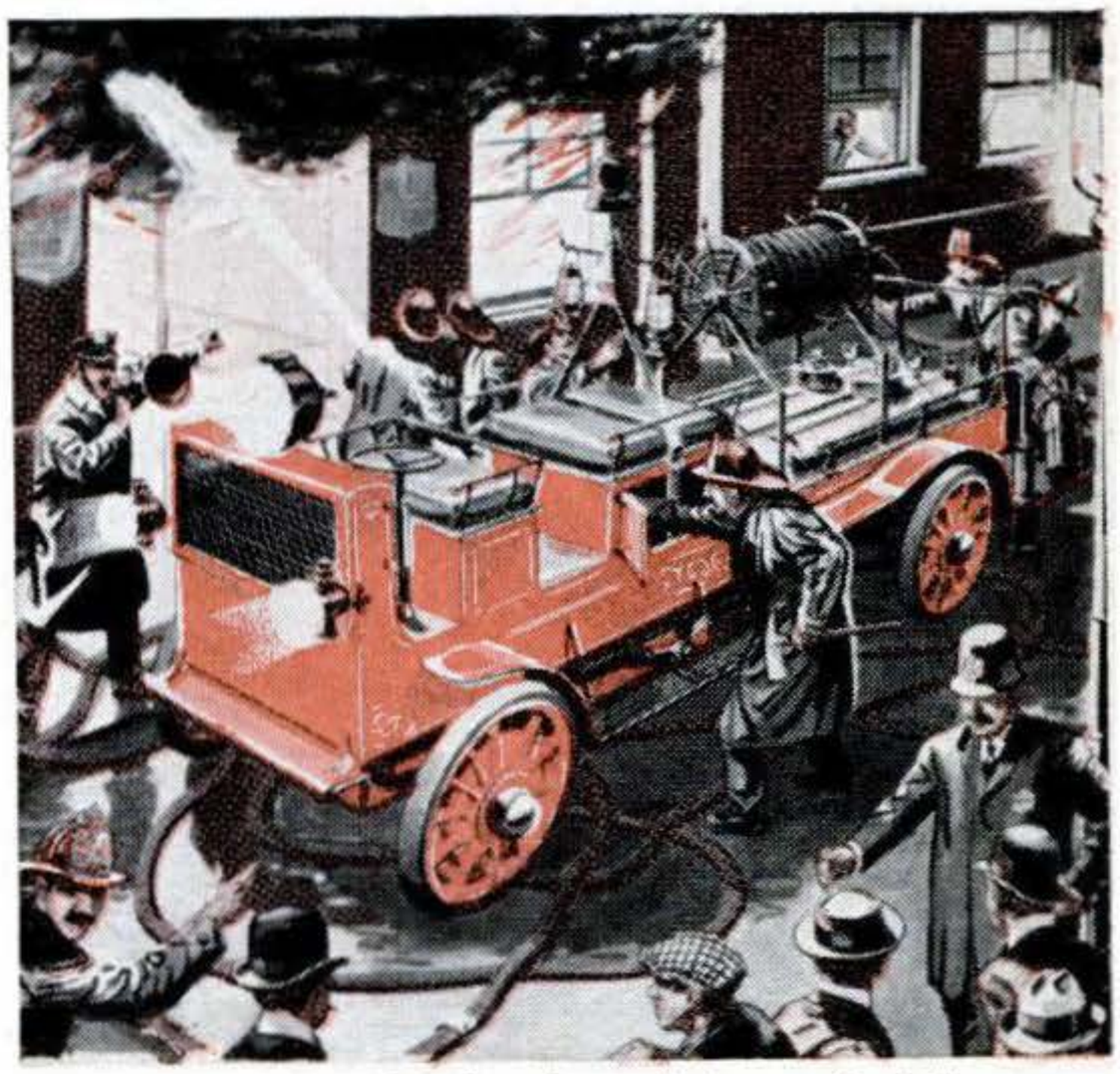

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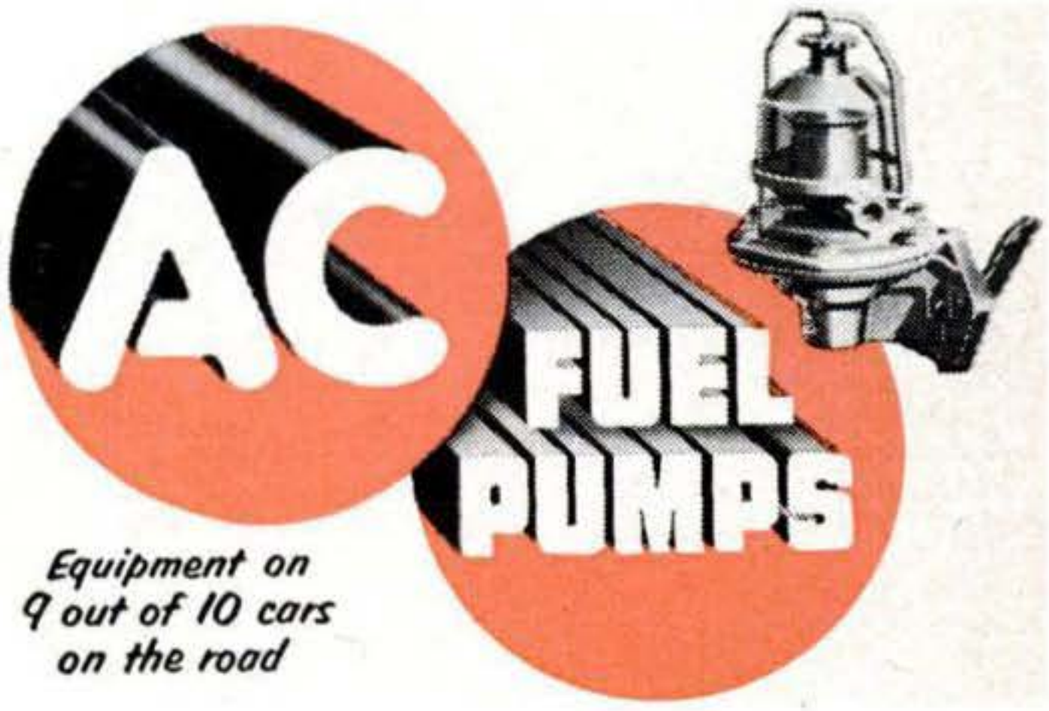

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650-16(6)	6.55	710-15	5.45	750-17	10.85	825-20	17.75
700-16	6.25	760-15	5.65	750-15	10.25	900-20	16.95
750-16(6)	8.85	800-15	6.65	825-15	12.05	1000-20	18.15
528-18	5.65	820-15	6.65	600-20	8.35	1100-20	18.15
550-17	4.25	670-16	6.05	650-20	10.05	1000-22	17.05
650-15	5.05	550-15	5.15	32x6(8)	10.35	1100-22	17.15
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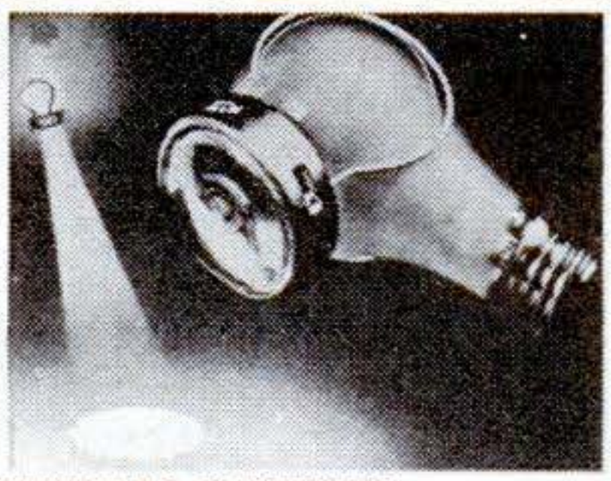

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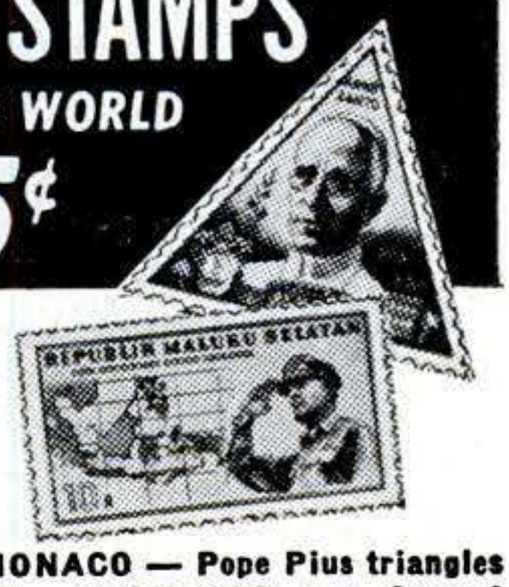

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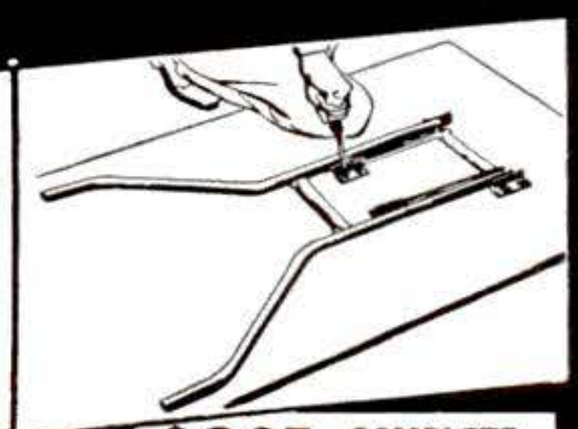

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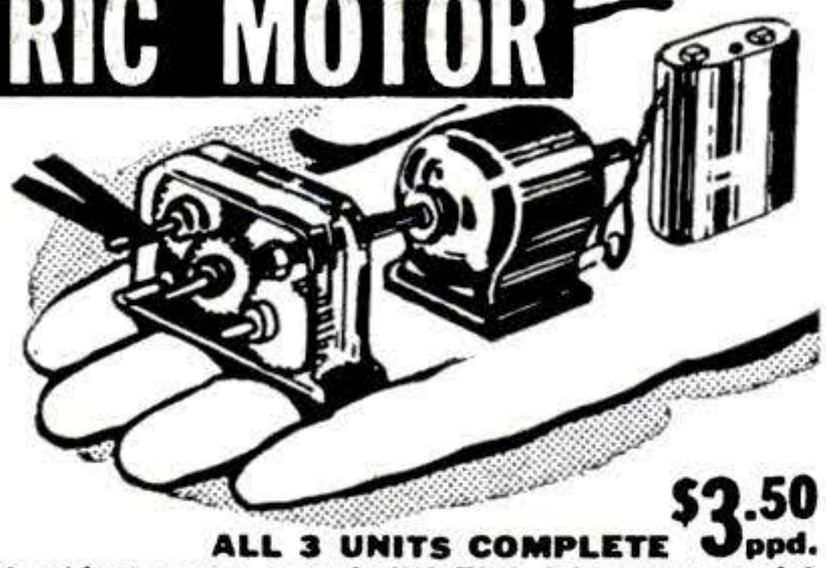

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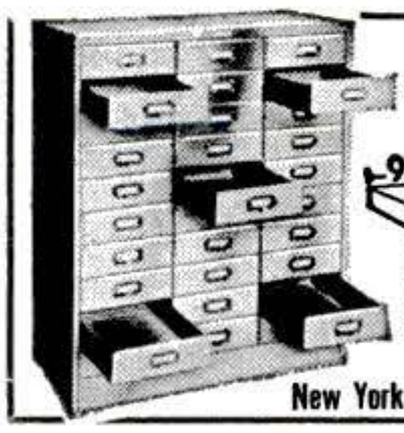

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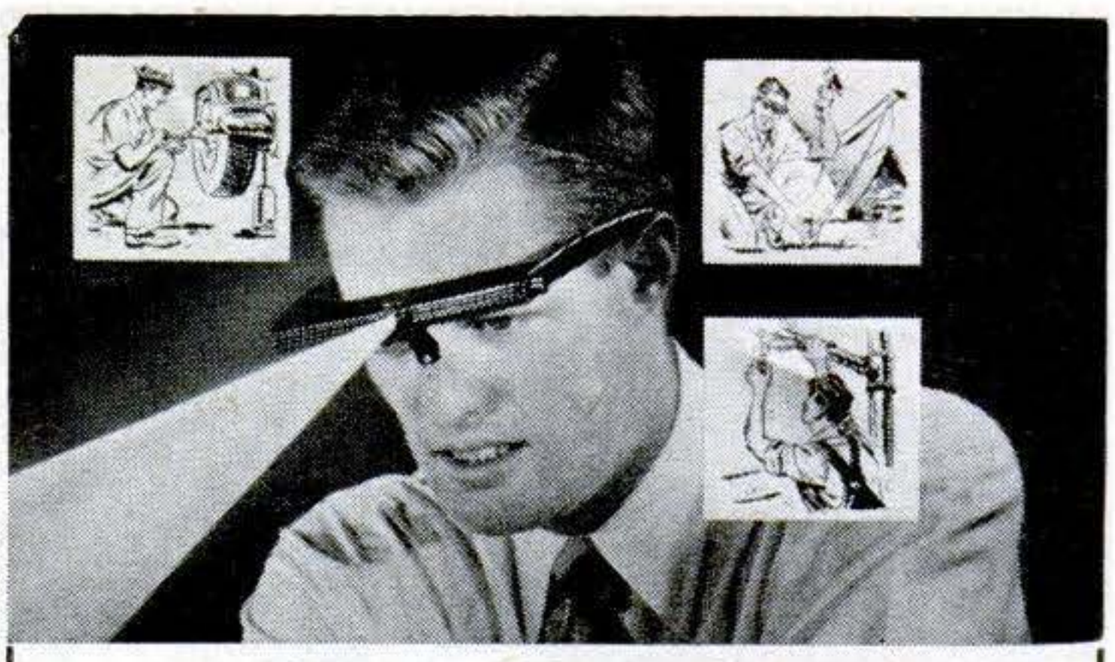

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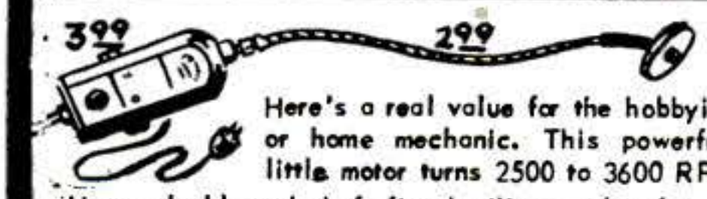

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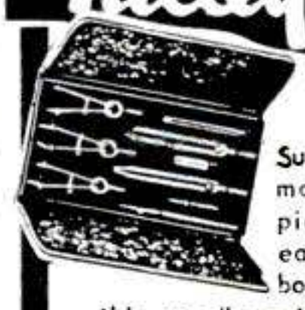

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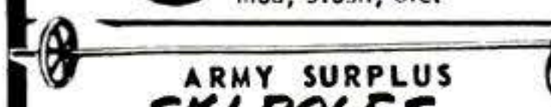

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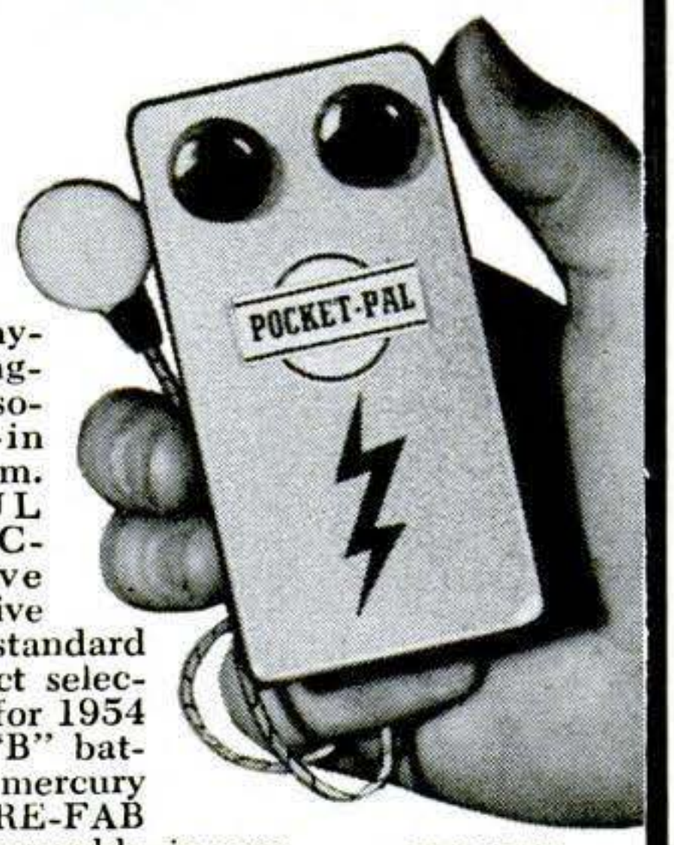

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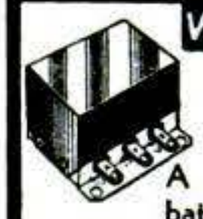

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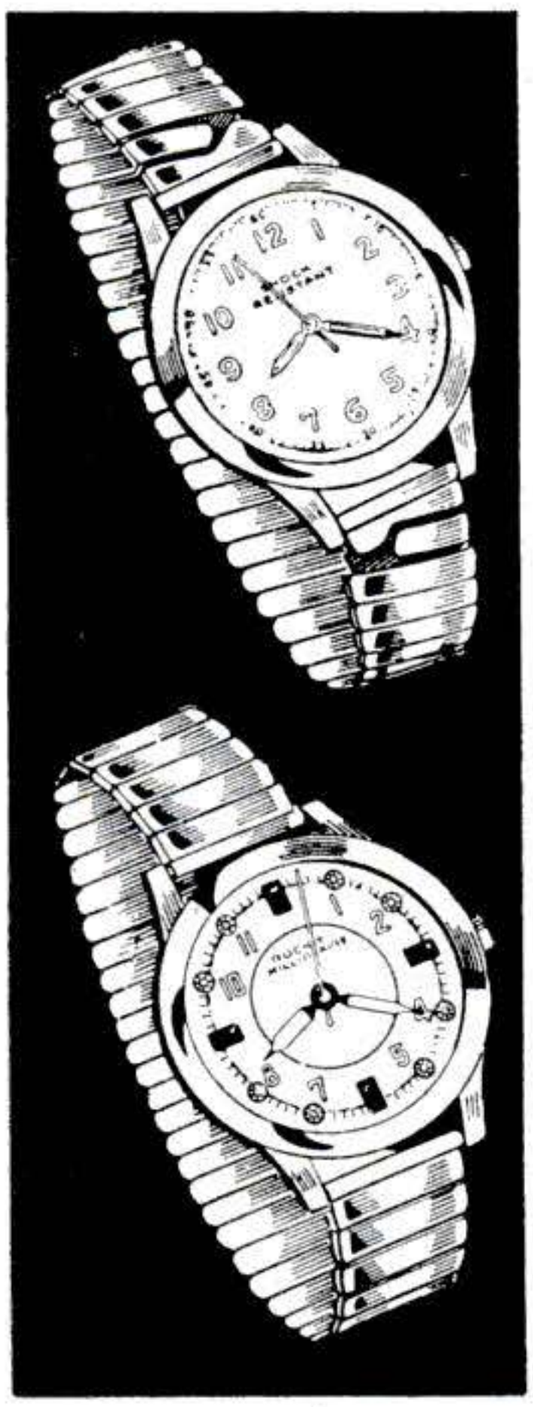

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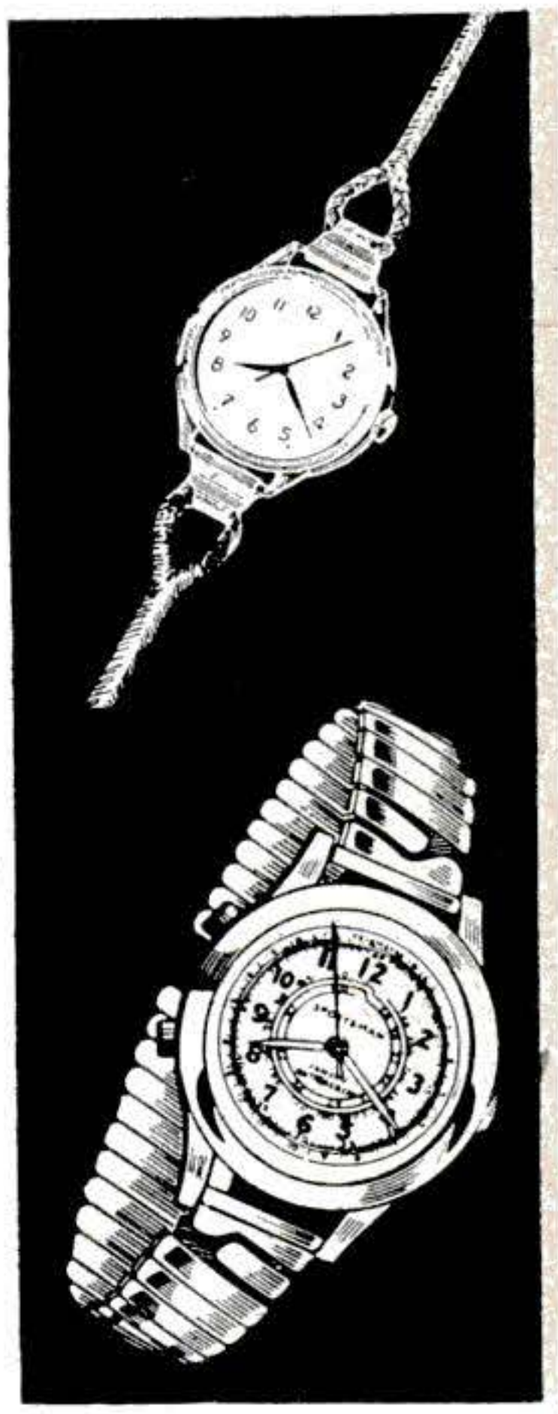

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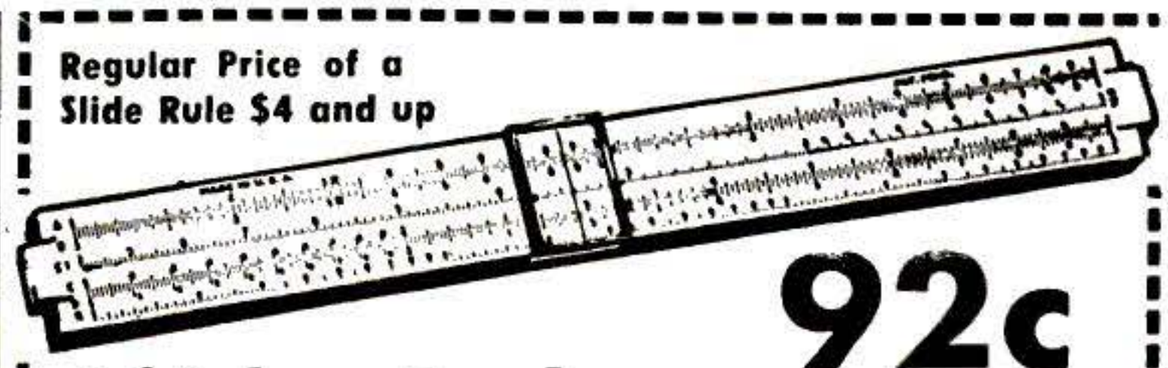

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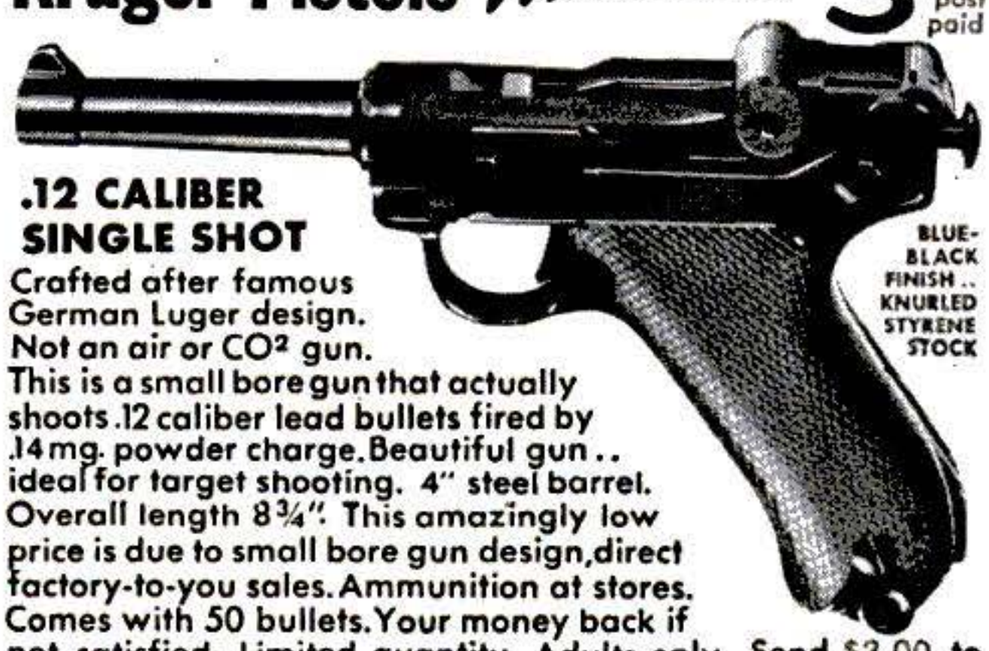

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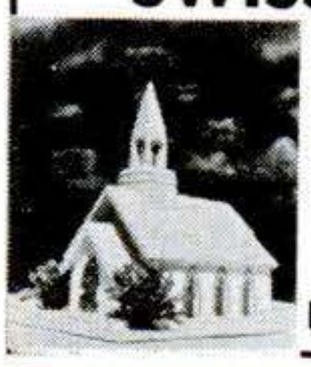

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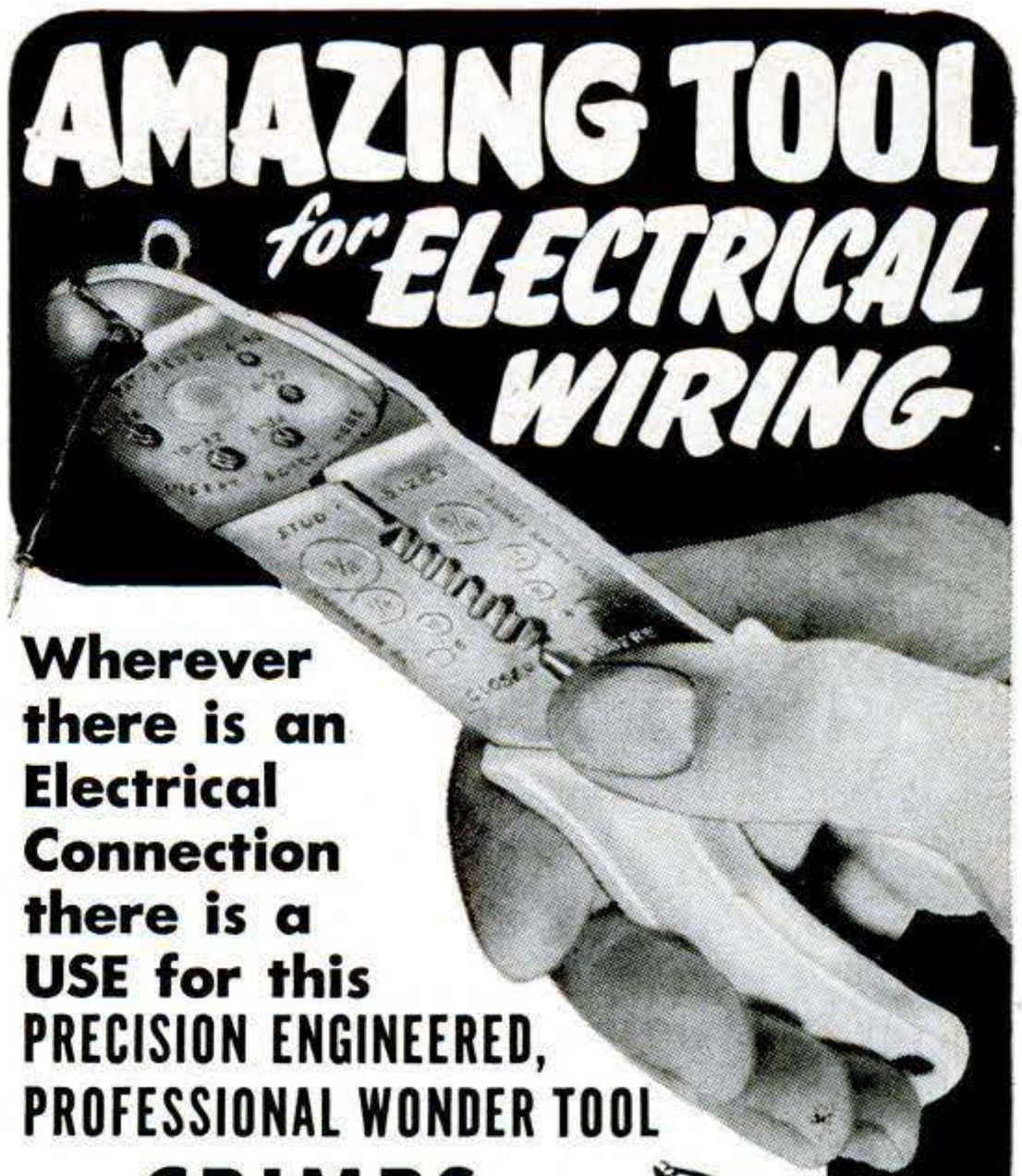

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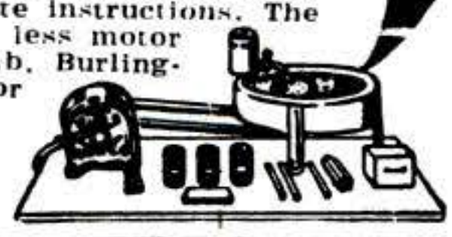

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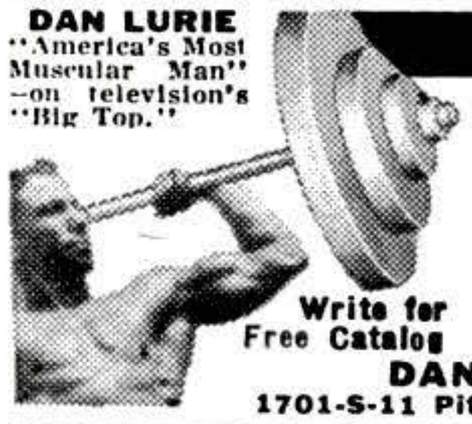

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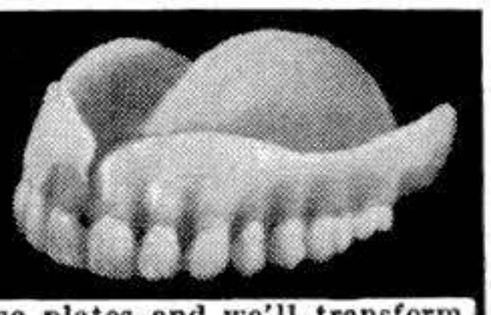

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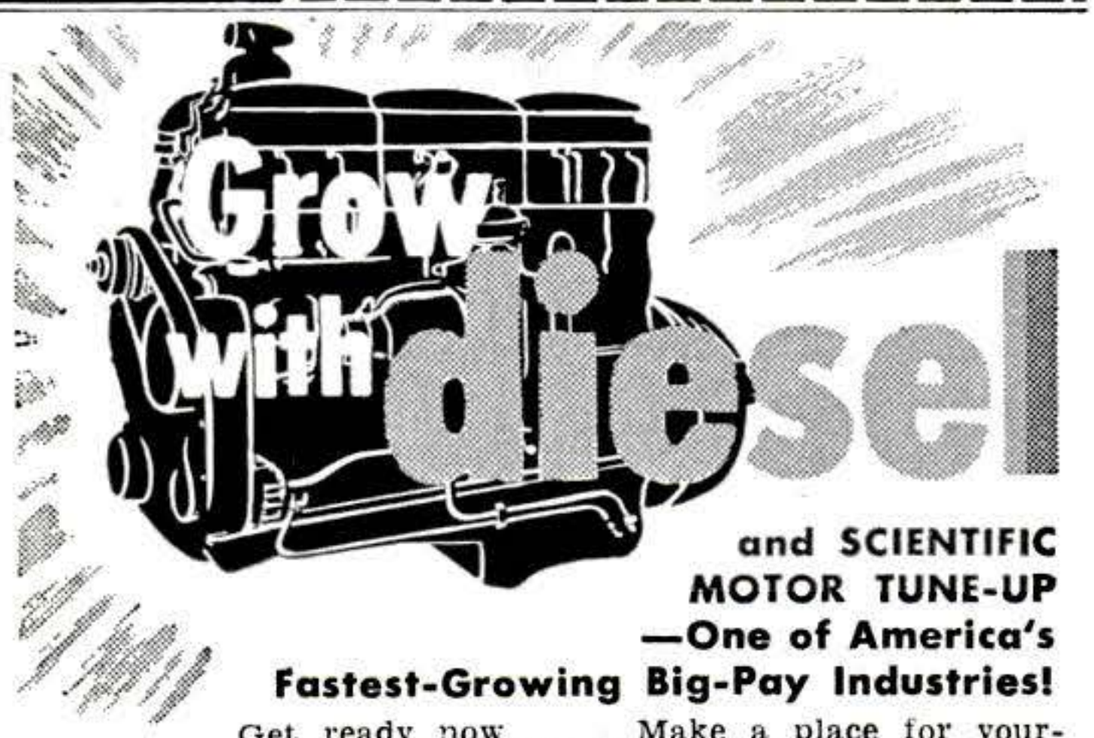

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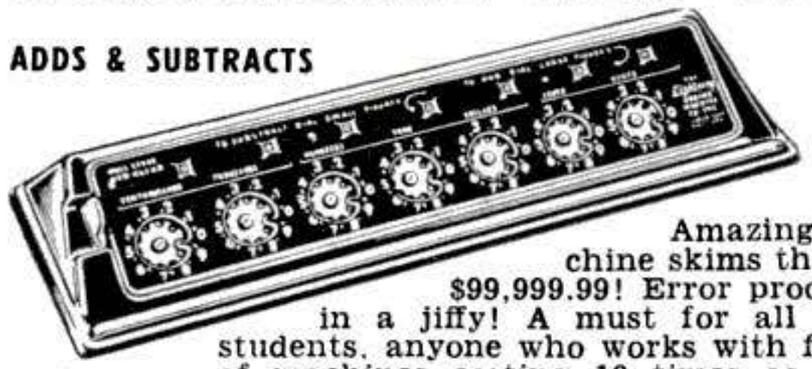

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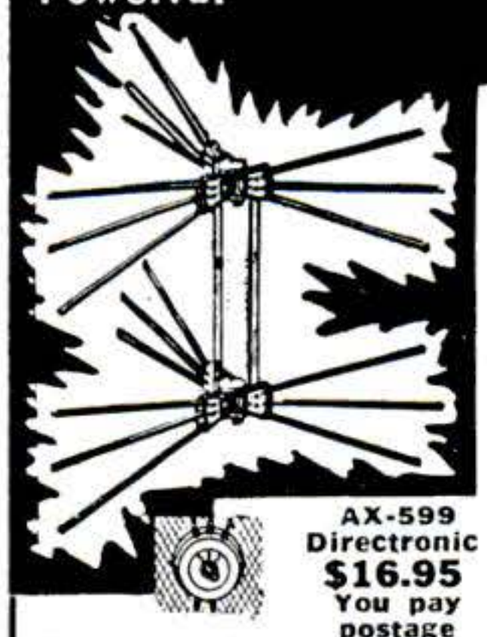

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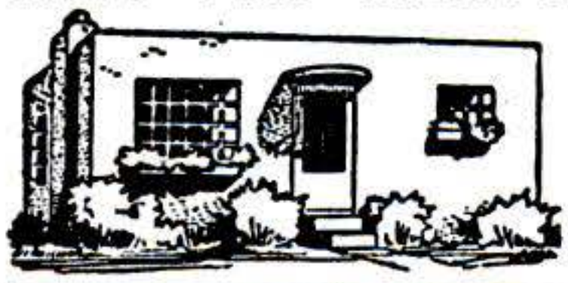

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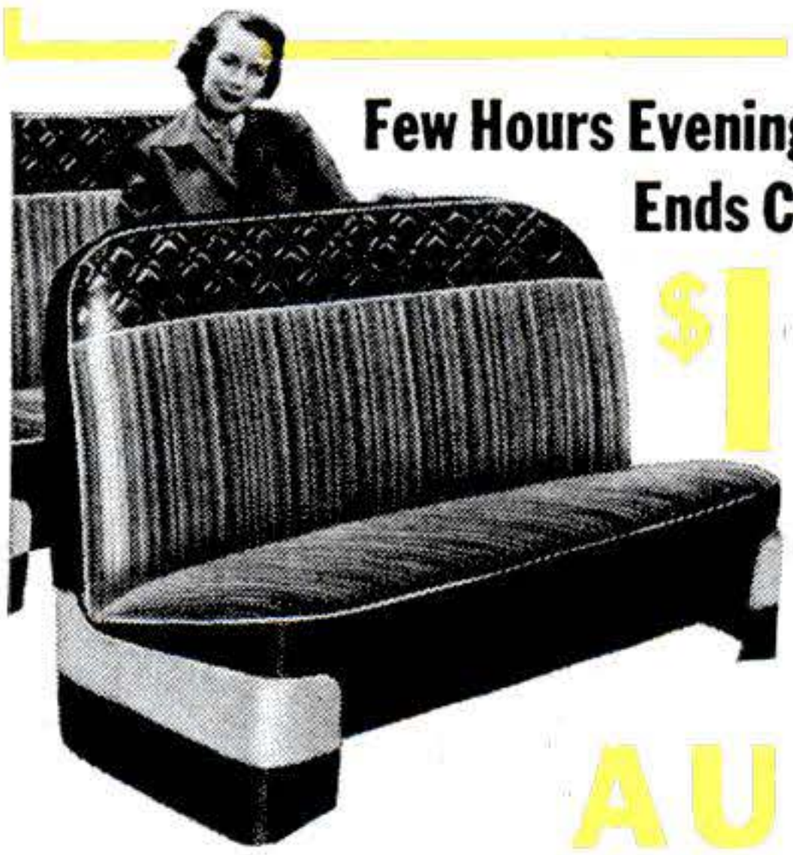

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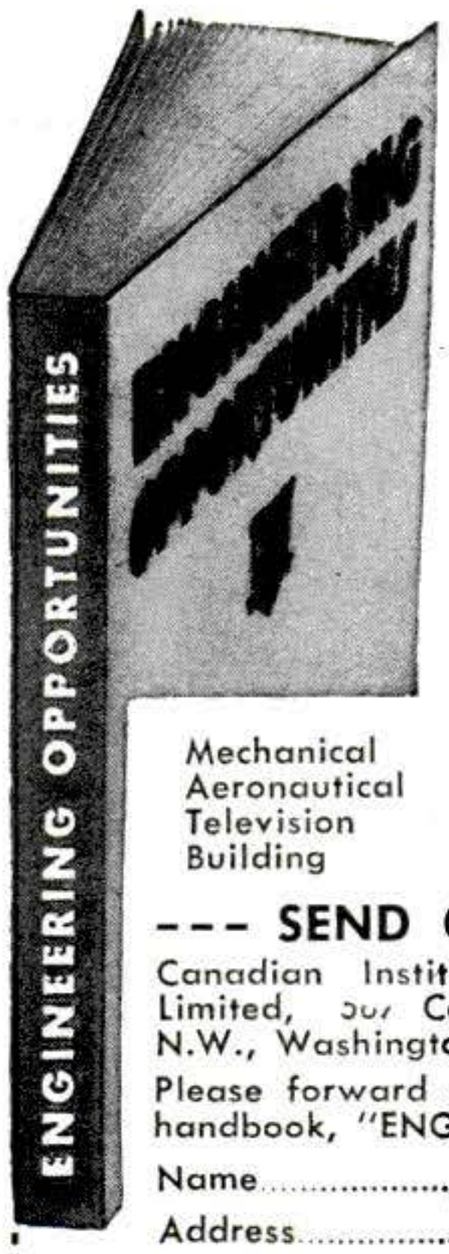

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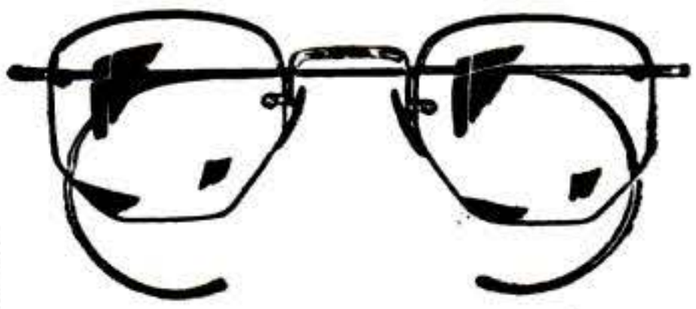

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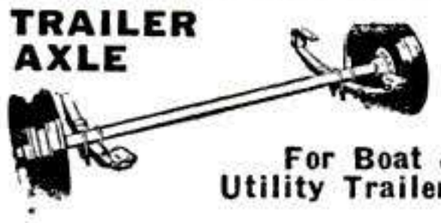

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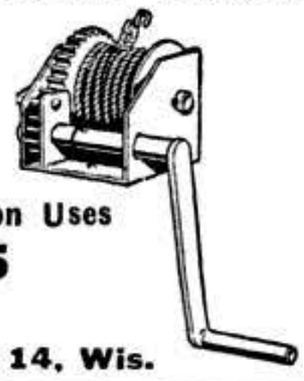

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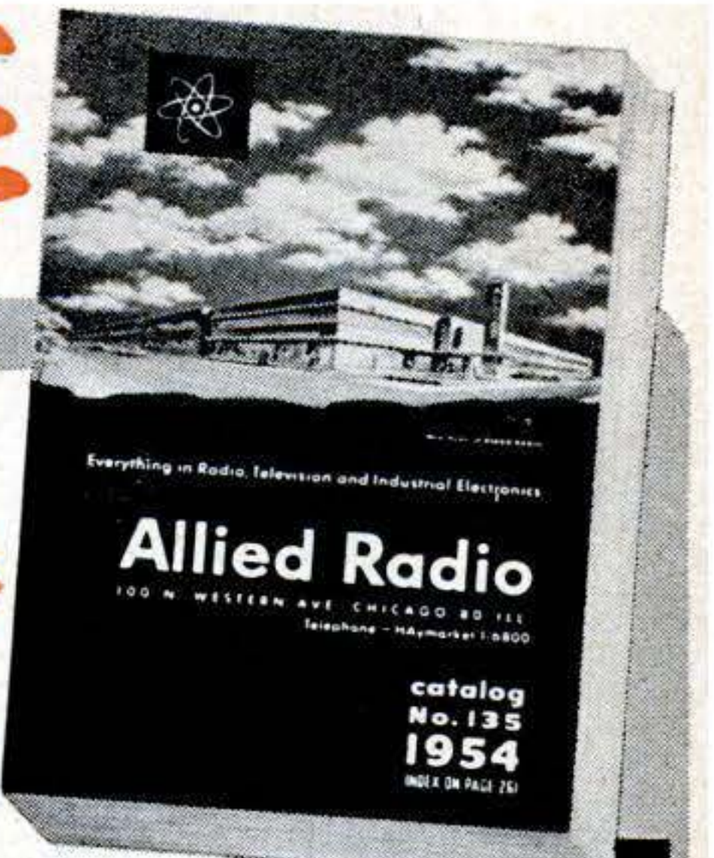

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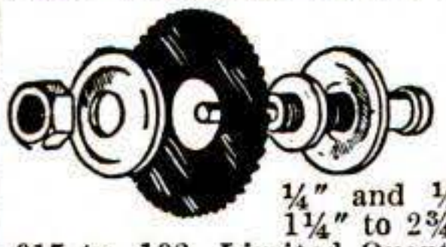

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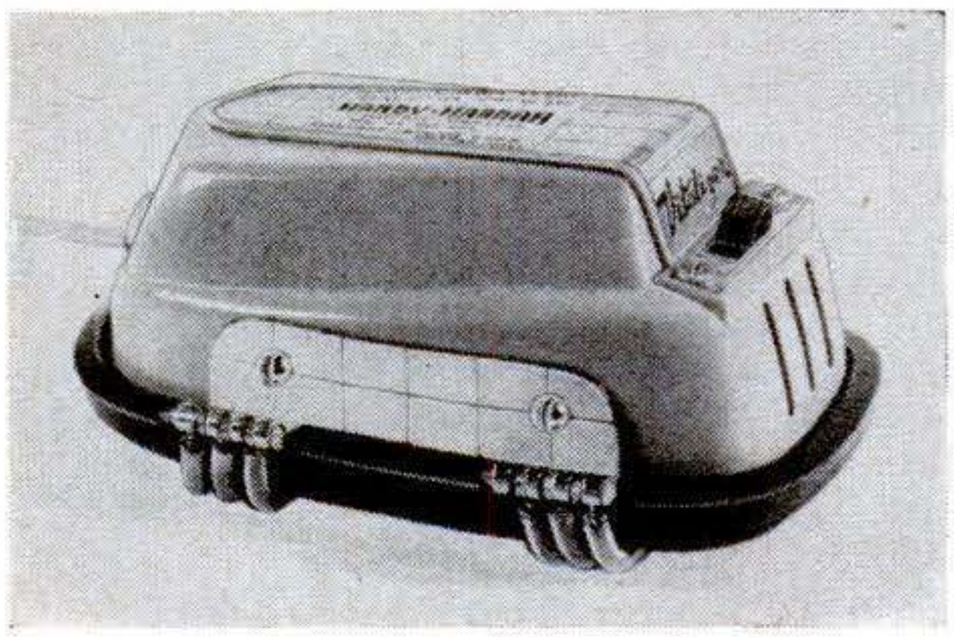

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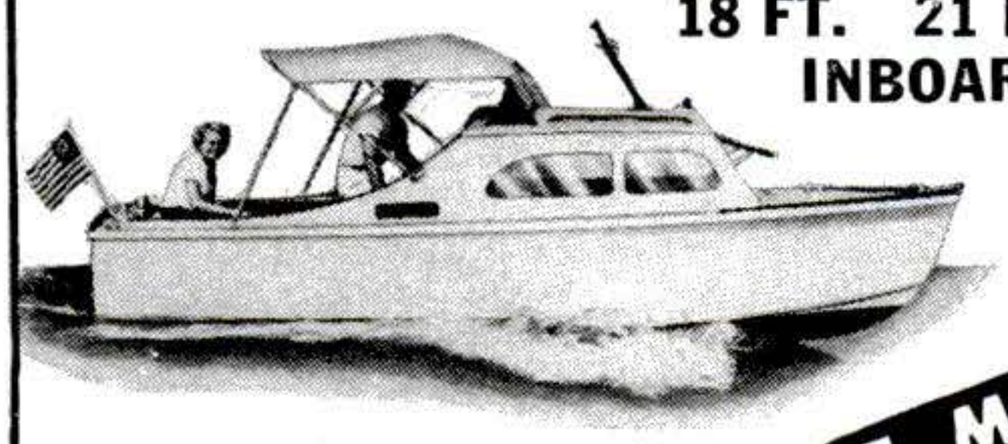

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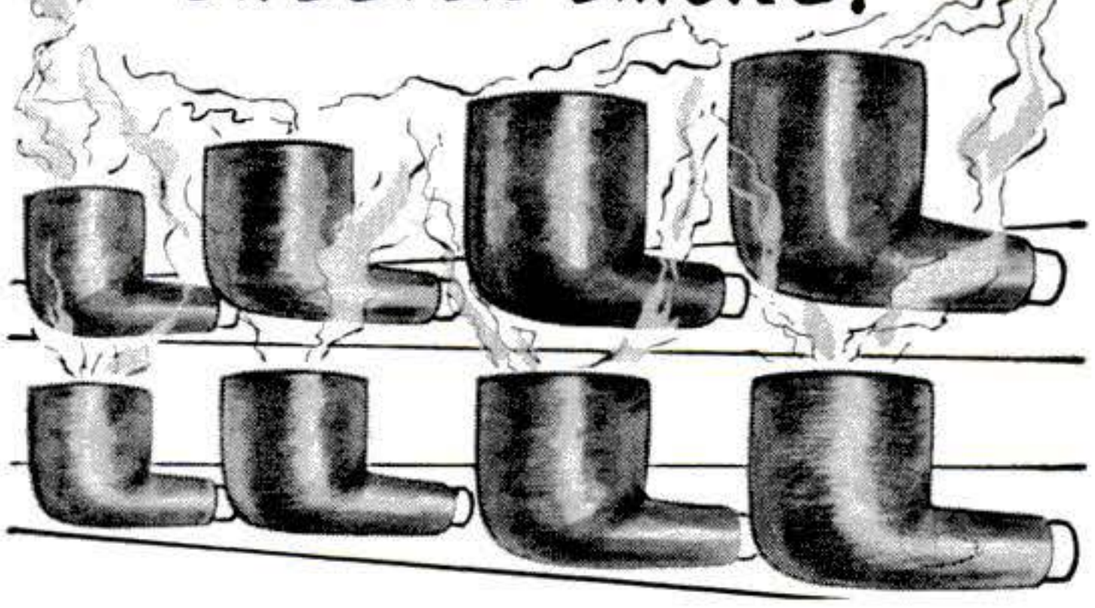

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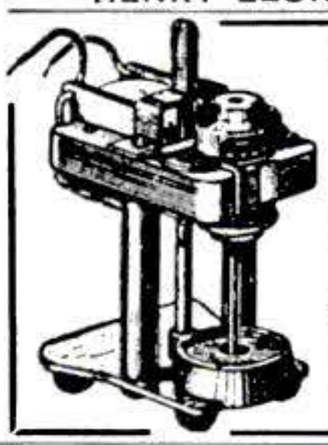

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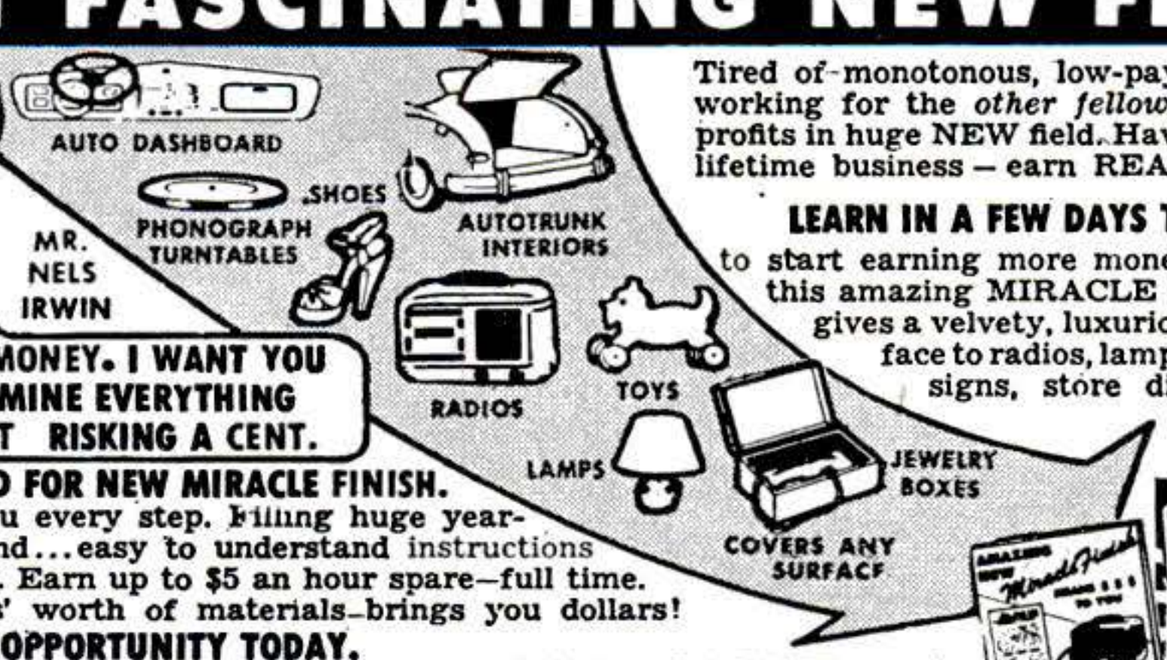

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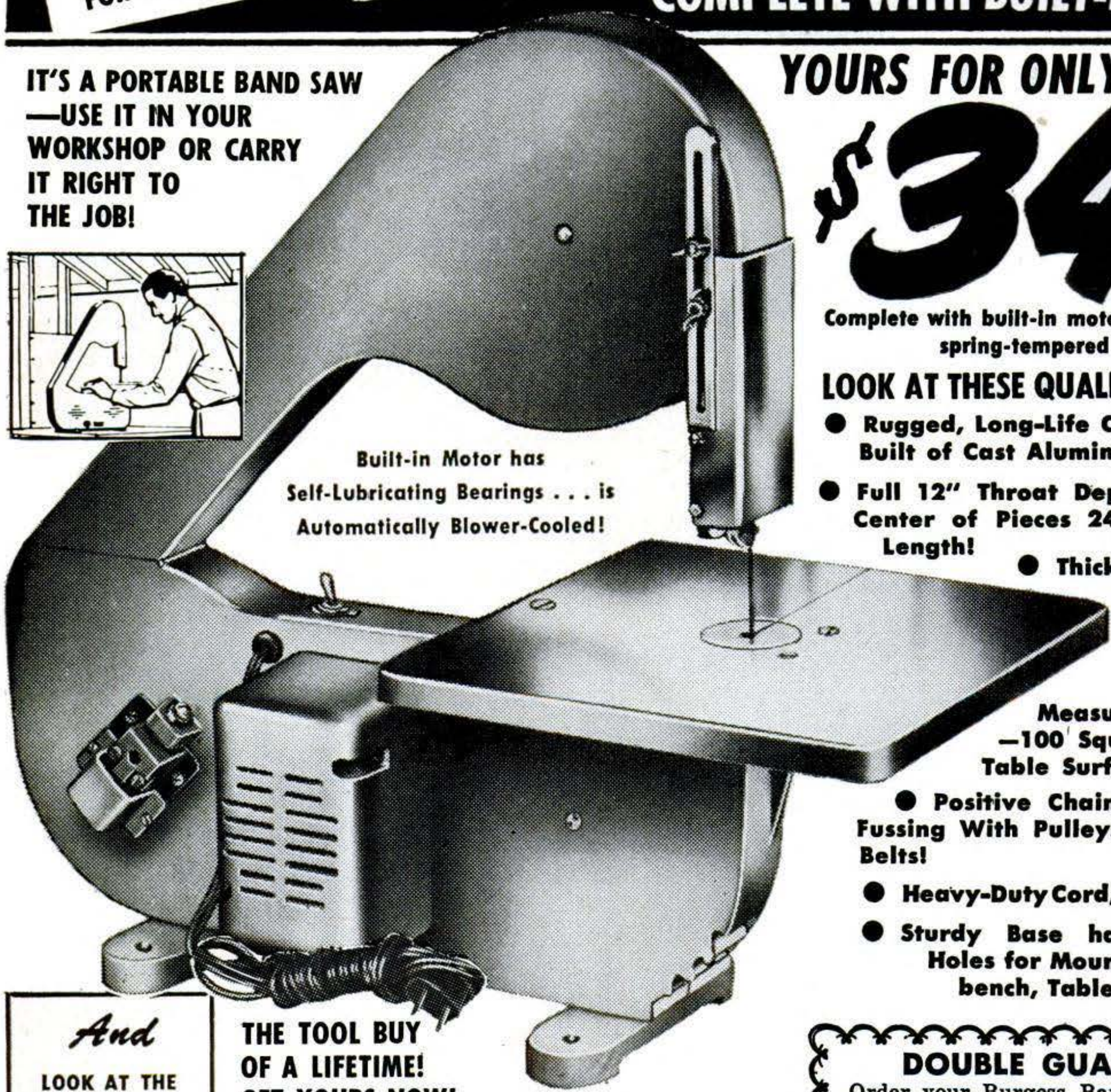

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LIQUID Rubber, make flexible molds. Free Sample. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

MAKE Perfumes And Cosmetics At Home, write "Carey Laboratories," 1914 Chouteau, PS-11, St. Louis 3, Missouri.

GET A New Start In Life In Collection Business. Free Details. Franklin Credit, Roanoke 7, Virginia.

BUY 250,000 articles wholesale. Directory 10c. Publishers, Box 1486-A11, Detroit 31.

SPARE Time business. No investment. Details free. Howell, 1320 St. Andrew, New Orleans 13, La.

GROCERIES Without Cost! Guaranteed! Free information! Jaydee, Box 664, Woodland 4, California.

$50, $100 WEEKLY possible. Get indisputable proof immediately. Exciting information 3c stamp. Harrison, 980 Empire, Benton Harbor, Mich.

EARN amazing profits by following our instructions; selling nationally advertised watches, etc. Enclose 25c, refundable. Receive multi-colored salesman's catalog and confidential price list. Result Sales D, 580 Fifth Ave., New York.

OWN, Operate Route—"Wishing Wells." Place these New $8.50 Skill Games on counters, in Cafes, Clubs, Luncheonettes, etc.—collect coins weekly. Details Free! "Legalcheres," Box 929, Long Beach 1, Calif.

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OPERATE "Escalator" Mailorder system, selling our products or any products. Fastest, most revolutionary mailorder system known. Write: Selbyco, Decatur 174, Ill.

MANUFACTURE durable plastic, easily —1c pound. Builds resilient floors, tough, insulative plaster and stucco; Built-ins; Charming, synthetic stone facing. All airtight, watertight, flameproof, pestproof. Build good home $150.00 room. Bays Laboratory, Oklahoma City 9.

FOOD mailorder business. Home operated. Everything supplied. Successful proven plan. Free details. Frazar Foods, Desert Springs 11, California.

CONTINUOUS work addressing and mailing our postcards. Over $50 week. Complete Instructions $1. Chemcraft, 466S Lowell Ave., Newton, Mass.

"INCOME" from local information. No Selling. Write Neherco, LaVerne 6, Calif.

BUY Wholesale thousands nationally advertised products. Save money! Make Money! Postcard brings details. Kemah Company, 5017-E Washington, Houston, Texas.

$250 WEEK reported! Free book "505 Odd, Successful Businesses." Work home! Expect something Odd! Pacific-36C, Oceanside, California.

EARN $2.00 Hour! I do—making Sandals. Youngs, 1308-PS South First, Arcadia, California.

MAKE Money mailing cards; circulars. Pleasant; Profitable. Paton, Box 55-A, New York 23, N. Y.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries, Grand Rapids, "Minnesota."

FREE details! Home operated mailorder business. Successful "Beginner's" plan. Everything supplied. Lynn, 10420-C National, Los Angeles 34, California.

DOLLAR value "Opportunity Packet" 10c. Hilltop Specialty, Blackwood, N. J.

EARN Money With Typewriter—Sewing Machine. Details Free. Edwards, 3915-PS, 12th, Des Moines 13, Iowa.

WHAT'S Your Field Of Interest? Whatever it is, specialized magazines will help you to greater success. Look over current copies of those covering your field through our Easy-to-Get-Acquainted service. Choose from 4,387 publications covering all fields—business, vocational, agricultural, sports, hobbies, etc. Write for current list. It's free. Commercial Engraving Publishing Company, 34S North Ritter, Indianapolis 19, Indiana.

20c BRINGS warehouse bargain catalog. Card's, Edgewood Drive, Niagara Falls, N.Y.

ADVERTISING book matches—Cash in on big demand—sell Union Label matches. Cuts for all businesses and political parties—Free powerhouse selling kit—low prices—protection guaranteed on repeat orders—Cash commissions. Superior Match Co., Dept. PX-1153, 7530 Greenwood, Chicago.

WANTED! Home Producers, by manufacturers in our Clearing House Service. Become a subcontractor, casting plastic products for these companies. Thousands of easy-to-make items required. Cash in at home, without previous experience. Plastic Service Associates, Dept. PS-11, East Boston 28, Mass.

EARN $15,000-$30,000 annually. Franchise protected. Guaranteed minimum $12,500 or money back. Live at home. No merchandise to buy. Self-employed. One of most exclusive and noncompetitive businesses in United States and Canada. Send 50c for explanatory book. Money refunded when book returned. Harrell & Company, Box A-2, Louisville, Illinois.

$15.00 THOUSAND Possible — highest prices compiling mailing lists and addressing from them; longhand, typewriter. Particulars free. Almon Torrey, Rowley, Mass.

START a lettershop on a shoestring! Sales $56,000. Started $36.00. Information? Wells, Box 13, Basking Ridge, New Jersey.

OPERATE Profitable Garden. Proven Plans Sent You. Yusko Products, R#3, Streator 19, Illinois.

CHRISTMAS Cash Addressing postcards at home. Starting instructions complete with mailing lists and directory, $2.00 postpaid. Cheatham, Dept. D-33, 6731 Musgrave, Philadelphia 19, Pa.

COPIES Of Leading Mailorder Magazine. Literature Describing Many Money Making Plans. Send 25c. Gilco, Dept. M. 20 Magnolia, Norwalk, Conn.

ELECTROPLATING. Profitable Home Business. Autoparts, novelties, giftwares, mirrors. Easy, inexpensive home processes. Free booklet. Tyco Metals, Box 13231-CN, Houston 19, Texas.

CASH-in during coming Income Tax Season. Establish profitable, dignified, Tax Return Business. Experience unnecessary. Free Prospectus. Union Institute, Lakewood 1-E, N.J.

UP To $10,000 Yearly! New, Exclusive, Mail Order Program! Participation limited. Rush 3c stamp for further details. Pacific Advertisers, Box 4097-W, San Diego 4, California.

PREPARE Now for security! Learn how you can operate a profitable little business of your own in spare time at home. Benefit from buying wholesale. Write now for free folder S. The Giftery, Box 12, Cincinnati 13, Ohio.

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MAIL Postcards At Home. Get Lots Of Orders. Keep all Money. Orders Filled Free. Schipper, 121-P Wilkins, Rochester 21, N. Y.

FREE Instructions—"Metallizing Baby Shoes". Mountings. Fosters, 1520 Ardmore, Chicago.

ADDRESS advertising postcards. Must have good handwriting. Lindo, Watertown, Mass.

EARN money at home, making rhinestone jewelry. Free catalog. Ebert, Box B183, East Orange, New Jersey.

START a Telephone Answering Service in your home, profitable life time business. Postcard brings details. Telephone Answering Service Consulting Co., Box 293, Lexington, Mass.

FREE! Unequalled, big profit, home mailorder details. Mailord, PS113, Southampton, New York.

50 MAIL Order Plans full or Spare time catalog free your name address. Lindholm Service, Box 2504, St. Ann Station, Minneapolis, Minnesota.

LEARN Sewing Machine Repair, electrify, sell. "How" to make big money at home spare time. New zigzag machines, etc., wholesale. Details free. Taylor Service, Hamilton, Ohio.

START your own profitable home mailorder business! We supply everything! Write today! Studio Products, Box 564-"D," Glendale 5, California.

DO easy addressing—mailing work from your home. Get cash orders, keep every cent. Write Paragon, Box PS-2194, Houston 1, Texas.

NEW Exceptionally profitable plans, ideas for home operated mail business. Rush name. Miller, 1772-R Carlyon Road, East Cleveland 12, Ohio.

SELF-Help Books, Courses, Manuals written. Ralph Underhill, Beebe, Ark.

START Silverware Renewal Service. Franchise, Exclusive. NuSilver, 508-PS11BO, Aurora, Illinois.

EARN money! Amazing plans! Easily mastered at home. Details free. Bruns, 216-E West Jackson Blvd., Chicago 6, Ill.

BE appointed Notary Public. Details free. Magnolia Press, Box 1272-S, Burbank, Calif.

BUILD luggage and cases at home. We sell your product. No special tools or equipment needed. Free details. Casecraft, 805-WC Sunset Blvd., Los Angeles 12.

BUY it wholesale. Manufacturers. Distributors. Over 850,000 items. Literature free. Olsen, 1231-B East Third St., Duluth 5, Minnesota.

IMPORTING is profitable. Details free! Warner's, Box 6, Fort Scott, Kansas.

Copyrighted material

$2,000 A Month—Easy, plan complete 10c for handling. Sundberg's, 1552 Essex Court, Willow Run, Michigan.

START Uncrowded profitable Fund Raising Supplies—Business, mail selling from home to churches, civic societies. Full Setup-Service. Free information. Harold, 69 Bennett, New York 33.

BE Notary Public. Rate higher. Details Free. Stationers, Helotes, Texas.

NOW Available. Inexpensive short course in mail selling. Rush name for free descriptive literature. Kilert, North Edmonton, Alberta, Canada.

1930 DEPRESSION forced me to invent my own business—a minimum-cost, high-potential home mailorder. Lucky design paid immediately. $1,000 to $3,000 every month since! Over half net! This original design, practically foolproof, is now mapped out to guide mailorder beginners. United States Postal Service approved. Literature free. Glover, Union City, Penn.

EVER hear record like this? Our home mailorder mails only 2,000 circulars monthly, yet takes in $1,000 monthly! Doing this since 1930's! Result of a streamlined mailing system that costs less to operate, and returns more income, than any comparable business. 2,000 circulars—$1,000! Details free. The Hearthstone, 220 E. Fourth, Mishawaka, Indiana.

WE Love our mailman—He leaves over $1,000.00 monthly in our rural mailbox. My college professor husband drafted a scientific home mailorder method. We bought a Texas ranch, live as we always wanted. Now we sell the "Ranch Mailorder Method." Operates anywhere. Inquire: Eveningshade Ranch, Helotes, Texas.

DESIGN for Living—spacious country estate, favorite outdoor activities, freedom to work or loaf, income daily in your mail. We have this. Wish everyone could. Assure me non-competing use of our privately-designed, self-operating mailorder system, and I'll outline complete procedure. I'll charge small fee. Jackson Manor, Winthrop, Mass.

25TH Anniversary next year of one of nation's oddest home mailorder businesses. Based on "perpetual motion" idea, selling one item only, with no effort at expansion, the "Business-that-Ran-Itself" will have brought a leisurely $300,000.00 in daily small orders. Case history outlines procedure, to interest public in independent livelihood. Information free. White Rose, 464 Duane, Astoria, Oregon.

MAKE Money at home mailing literature offering fast selling books and merchandise. Everything supplied at low cost. Rush name. Thomas Jerdon, Hermansville, Maryland.

FREE Electroplating Information. Money Making Plans. (Formula Included). Send postcard for your copy. Highly Paid. Interesting. Uncrowded field. Plater D. Hyde, 327 West 120th Street, Los Angeles 61, California.

$46 FROM Square Foot Plywood; Jigsaw necessary. Write: Woodart, Bridgewater, Mass.

FREE Vending Machines; if used to sell our profitable nuts. Continental, Box 1361-B, Milwaukee 1, Wisconsin.

FREE samples Diagrams Instructions. Completely new enormously profitable business. Send 25c coin for handling. Hobby, 243 S. Lexington, St. Paul 5, Minn.

BUY Wholesale. Make, save money. Sensational details. Younge's, Kent, Ohio.

38 MONEYMAKING OPPORTUNITIES

SELL Titania gems; $9.75 carat wholesale. More brilliant than Diamonds. Free catalogue. Diamonite, 1404-S Mitchell, Oakland 1, Calif.

SPARETIME Profits Taking Subscriptions. All Magazines. Wholesale Catalog Free. Cassell Agency, Westfield 1, N. J.

START A Buying Service, buy wholesale thousands nationally advertised products. Make big profits selling at sizeable discounts. Postcard brings details. American Buyers, 630-T Linden, Buffalo, N. Y.

SCHOOL Seniors—Sell Classmates America's most beautiful Graduation Name Cards. Largest selection. Highest commission. Outsells all others. Free sample kit. Printcraft, Dept P, 1509 Maple St., Scranton 5, Penna.

DETECTIVES Earn Big Money. Experience unnecessary. Detective Particulars free. Wagoner, P-125 West 86th, N. Y. 24.

WIN contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609-A East 5th, Duluth, Minnesota.

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MAILORDER—Operate profitable home business using Free Advertising Method reaching millions. Revealing information free. H. G. Seidel, 7070 Hollywood Blvd., Hollywood 28, California.

MAKE Money addressing Envelopes! Our information reveals how. Only 30c. Business, Dept. 45-L, P. O. Box 2224, St. Louis, Missouri.

$1,000, $4,000, $10,000 BEING made spare time at home. Simple Mail-Order secrets shows you step by step. Details 25c. Port Book Service, P. O. Box 453, Port Chester, New York.

MAKE Money—At home by mail. Fast, Easy. Liebig Industries, Beaver Dam 2, Wisconsin.

50% PROFIT on name brand watches. Send for free circular. Arro Sales Co., 1261 Brinton Rd., Pittsburgh 21, Pa.

$10,800 PROFITS! Your Own Mailorder Business! No risk! "Success Plan" Free! Treasury, 709 Webster, New Rochelle PS-17, New York.

FREE! "301 Profitable Small Businesses!" Amazing shoestring plans! Work Home! Start Sparetime! Deumant Surveys, Kenmore 23-S, New York.

101 WAYS To Make $1,000 At Home. Details free. Business Surveys, 365 So. Fairfax, Los Angeles 51, California.

MAKE $2600 a Year Spending 5 Hours A Week. Start At Home. New Machine. Small Investment. Free Booklet. A. Z. Co., 442 N. Seneca, Wichita 12, Kansas.

MAKE Money With Wood—Ask Us How. The Dormers, Great Barrington, Mass.

GET Facts—$4.00 merchandise, $2.00 treatise 100 money makers. $6.00 value $2.00. Kahn, 506 West 45th, Chicago 9.

STRANGE "Dry" Window Cleaner. Sells like wild. Replaces messy rags, liquids. Simply glide over glass. Samples sent on trial. Kristee 180, Akron, Ohio.

MEN! Women! Address folder Cards! Positively No Deposit! Enclose stamped addressed envelope; write Allen Company, Tillar, Arkansas.

ROSARIES—Make Your Own! For gifts—fun—profit! See complete line of religious goods—gold filled and sterling rosary parts. Medals, books, statues, novelties. Big group of make-it-yourself items. Send 10c for New Wholesale Illustrated Catalogue—just off the press, bigger than ever! Greylock Creations, Box 1048-PS, Pittsfield, Mass.

MANUFACTURE Rhinestone and Pearl Jewelry at home. Latest creations, tremendous profits, no skill needed. Postcard brings illustrated catalog of settings, stones, etc. A. V. Cutt Co., Inc., 210-H Fifth Ave., New York 10, New York.

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GET $10.00 by Mail: Keep $8. Terrill, Bogard 2, Mo.

START a Mailorder Business on small capital. Details $1.00. Fred Hettick, Bismarck, North Dakota.

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101 WAYS To Make $1,000 At Home. Free Details. Business Surveys, 365 So. Fairfax, Los Angeles 38, Calif.

EARN $50-$100 Weekly in home operated Mail Business. We show you how. Write Lewis Bartlett, Richland, Georgia.

MAKE to $4.50 hour doing common pen lettering. National Artists, 801½-C North Marsalis, Dallas 3, Texas.

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WEEKLY extra income mailing circulars for advertisers. Complete instructions 25c. Enterprise, 21-D Sanford, Boston 26, Mass.

DISTRIBUTE our magazines evenings. Profitable homework. Experience unnecessary. Your name, address printed as publisher. Samples, materials, instructions, $1.00. (refundable). Wright Publications, 2276-P Hubbard, Memphis 8, Tennessee.

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MILLIONS For Small Businessmen. Large list. $1.00. Proven Enterprises, 334 S. Wabash, Rm. 1, Chicago 4, Ill.

1000 MONEYMAKING plans! Folder free. Newton, 505 Cherry, Bonham 8, Texas.

HAVE Money-Making Home Mail Business—Complete Idea-Mailbox service-Personal help assures success. NMD Agency, Box 88-C, Dorchester 22, Mass.

FREE Folder! How To Make Thousands Yearly Selling By Mail The Way That Pays. Fullmer, 92-B Greenwood, Pocatello, Idaho.

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MAKE Yourself Financially Independent: Start a Unique success proven Mail Order Business that's really Tops. No Capital Needed. Write: — Sears, 7019 Georgia Avenue, NW, Washington 12, D.C.

YOUR ideas are worth big money. Experienced consultants will develop and sell your ideas. Top notch engineering service at low cost. Free information. Scientific Enterprises, Box 2100E, Cleveland 8, Ohio.

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LEARN How You Can Own Successful Mailorder Business within one year! No experience necessary! Amazing Details Free! Write: "Opportunity", 166-K Montague, Brooklyn 1, New York.

HOMEWORK! We Pay Cash! Experience Unnecessary! Hirsch, 1301-B Hoe, New York City 59.

NEW plastic engraving, carving machine. "Dupliscaler". Fun and profits carving plastics! Details, sample 25c. Desco Distr's., 6334-Z Sepulveda, Van Nuys, Cal.

MEN-Women: If you are interested in addressing advertising literature for national firm, rush 3c stamp for further information. Advertisers Service, Box 4097-PS, San Diego 4, California.

TO $35.00 Weekly. Upholstering spare time. Instructions $1.00. Custom Upholstering, Oxford 2, Penna.

AMAZING process permanently seals snapshots, cards, etc. in plastic. Earn extra money taking orders. Send 60c and two snapshots for sample work and particulars. Refundable first order. Variety Sales, Box 11533-P, Los Angeles 48, Calif.

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BEAUTIFUL Feather Pictures. 200% Profit! Free sample. Apartado 9036, Mexico 1, D. F.

$$$ IN Personalized Baby Record Books. Sell By Mail Use Same Literature We Do. No-Co-Ro, Oakland 6-P, Calif.

$35 WEEKLY addressing envelopes. Instructions $1, refundable. Adservice, Spring Valley 36, New York.

FREE! Complete Mailorder Business! Terrific Profits! No investment. Write today. Vita-Mins, 2908-PS, Beverly Boulevard, Los Angeles 57.

WANT to retire? I did at 30! Delightful set-up brings me $1,000 monthly to any mail address! Easily duplicated. Around one product I formed a countrywide marketing team controlled by one set of reins from one room. Apply my system around your product. Details free. Williamson, 81 N. Mt. Trail, Sierra Madre, California.

BE appointed Notary Public, your state. America's lowest cost. Thrilling experiences. Additional income. Men, women. Young, old. Write Box 3025, Dallas 2, Tex.

POCKET Combs: Gross $1.40; Joe's Products, Southwick Street, Fitchburg, Massachusetts.

MAKE big money mailing our merchandise catalogs, sample catalog, details 25c. Products, 526 S. Western, Chicago 12, Ill.

ALMOST a family tradition, our extraordinary home mailorder—a rare kind we created years ago—goes on giving us $12,000 a year (near 25 years!) practically unattended! No addressing; no mailing; surprisingly little expense! Ideal one-person, low-budget, steady-income system. Details free. The Homestead, 1674 Soniat, New Orleans 15, Louisiana.

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NEW liquid casting plastic. Clear. colors. Embed flowers. insects. coins. Saw. drill. carve. Send 25c for Castolite Creations Manual and proved Success Plan showing how to make money at home. Castolite. Dept. M-102. Woodstock. Ill.

LEARN Plastics at home. Complete course—$5.98 postpaid. Dime brings sample plastic. three experiments. full details. Plastic Projects. Box 5151. Detroit 35. Mich.

PLASTIC Sheets. Rods. Tubes; etc. Free List. Plastic Supply Co., 2901 N. Grand Blvd.. St. Louis 7. Mo.

PLEXIGLAS. Lucite. Any size sheets. Square foot (12x12) cost. 1/16". $1.18; 1/8". $1.55; 3/16". $1.90; 1/4". $2.25. Add 15% for postage. Minimum order $3.00. Almac Plastics. 600 Broadway. New York City.

PLASTICS—Cements—Dyes—Findings—Carvings. Wholesale prices. 64 page catalog free. "Trace & Carve" pattern book for carving and coloring fish. birds. animals. only 35c. Taylor & Art. Inc., 1710 East 12th St., Oakland 6. California.

DIRECTORY of Manufacturers. for liquid plastics. liquid rubber. wholesale. Castleco. 2139S. Paterson. New Jersey.

FIBERGLAS. Polyester. Plexiglas. Acetate. Vinylite: Casting. coating plastics: My own Fiberglas "How" book now ready —$2.50. Fast service. best prices. Catalog —10c. Airmailed—35c. Gem-O'-Lite. Box 6868P. North Hollywood. California.

UNUSUAL Christmas decorative materials fill our complete catalogue. Van Horn Plastics. 1905 Ingersoll. Des Moines. Iowa.

TUBING. Wholesale! For Model Airplanes. Railroads. Chemical Experiments. Etc. Send For Samples. Technical Data 25c. Hobby Vinyls. Sunbury. Ohio.

41 CHEMICALS & APPARATUS

NEW Idea Chemical and Apparatus Outfits for Home Experimenting Photo-Scales. Microscopes. Chemicals. Biological and Laboratory. Supplies in Small Quantities. Catalog 25c. Established 1931. John H. Winn. 124-B West 23rd Street. New York. N. Y.

SPECTROSCOPE for quick chemical analysis $3.00. Cutting Sons. Los Altos. California.

LUMINOUS Paints will glow in dark. Six colors. Fairmount Chemical Co., 136 Liberty St., New York City 6.

ILLUSTRATED Catalog: Chemistry. mineralogy. biology 10c. Tracey Laboratories. Evanston. Illinois.

CHEMICALS and apparatus for industrial. analytical and private laboratories. Catalog 25c. Dept. M-26. Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20. N.Y.

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AMAZING New Book of Science. Experiments. Formulas and catalogue of Laboratory Supplies. Only 25c. National Scientific Co., Dept. 15. 2204 W. North Ave., Chicago 47. Illinois.

CHEMICAL. Supply Catalog. 15c. Laboratory Sales. Box 161-B. Brighton. Mass.

42 HELP WANTED

FLORIDA jobs. Tampa. St. Petersburg. Clearwater. Help wanted columns. $2.00. H. Minsenberger. Box 767. Largo. Florida.

FOREIGN Employment Construction Work. If interested in foreign projects with high pay. write Foreign Service Bureau. (Dept. P.S.). Metuchen. New Jersey.

300.000 NEW workers wanted now—in the Delaware Valley . . . Philadelphia . . . Camden . . . Wilmington. Industries are spending 2 billion dollars for new factories. Send $2.00 to L. Melanson. Box 1002. Kennett Square. Pa. for information.

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WORK overseas! 23 firms seeking applications from construction men. equipment operators. clerks. skilled. etc. Plus details on 269 overseas projects underway. (Every major U.S. contractor working abroad!) Transportation paid. Overtime. On some. skilled earn $340 weekly. laborers. $255. Printed. plastic bound manual. application forms. complete. $1. Jobservice D-1. Box 30. Billings. Montana.

FOREIGN Job News and Domestic. Send $1.00 for World Wide Construction Projects. How-When-Where to apply. Global Reports Monthly. Box 883-Sx. Hollywood 28. Calif.

ADDRESS advertising postcards. Must have good handwriting. Lindo. Watertown. Mass.

CONFIDENTIAL reports. Highest paying jobs in 28 countries. including U.S.. Alaska. South America. Europe. Middle East. Many average $1450.00 monthly. Skilled. unskilled. laborers. trades. supervisory. clerical wanted. Only $2. including one year registration-advisory service. Satisfaction guaranteed. National Services. Box 2954SA. St. Louis 17. Missouri.

ALASKA!! Last American Frontier. $1.00 brings 1953 Business Directory & Government Map. Military & Civilian Construction; Homestead & Highway facts; Mining. Aviation. Fur Farming. Grazing. Timber. Travel directions. List of firms hiring. How to apply. Alaska Opportunist. Box 92-S. Hollywood 28. Calif.

$1300 MONTHLY for truck drivers. $1400.00 monthly for carpenters. electricians. plumbers. mechanics. $1200.00 for clerks and laborers. Replacement hiring now being done. Full information and complete foreign listings. with current information on Spain job. $1.00. Women's listings. $1.00. 25.000 men and women needed for new stateside project! Complete information and other domestic listings. $1.00. Dept. 4-K. Opportunities Unlimited. 1110 Commerce Bldg.. St. Paul. Minn.

JOBS. Foreign and Domestic. Supervisory. Technical. Mechanical. Clerical. Marine. with largest companies the world over. Opportunities for highest salaries and free travel. Send $1.00 for latest complete details and application blanks. Our Research Department headed by world traveler. 30 years experience. You need his advice. No job service equals this. Will prepare and type your individual letter of application for small fee. Job Application Service. Box 1022A. Baton Rouge. La.

SOUTHERN Florida's recent terrific. booming. expansion. has created tremendous opportunities! All Fields! Huge job list. housing information. etc.. just $2! (cover cost postage-handling). Employment Service-M. Box 182. Ft. Lauderdale. Florida.

GOLDEN California—Men needed. Thousands of openings. Jobs to $5.000.00 year unskilled. $8.000.00 year skilled. Act Now! Send $1.00; California Job Opportunities. Box 870-J. Los Angeles 53. California.

EMPLOYMENT SERVICES

FOREIGN Jobs. Contracts underway and soon starting in Africa. South America. Canada. England. Europe. South Pacific. Middle East. Mexico and Alaska. Send $1.00 for foreign job news. information. application forms. etc. DCS Foreign Job News. Dept. 268-NV. Bridgeport. Ill.

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CONSTRUCTION Job List. Published Monthly. $1.00. Dempster's Construction Scout News. Dept. 268-NU. Bridgeport. Ill.

43 AGENTS WANTED

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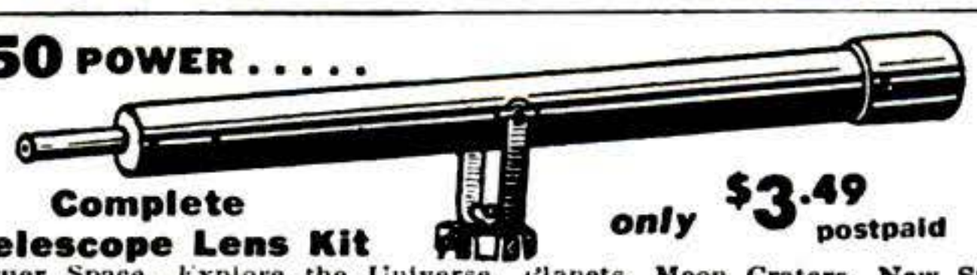

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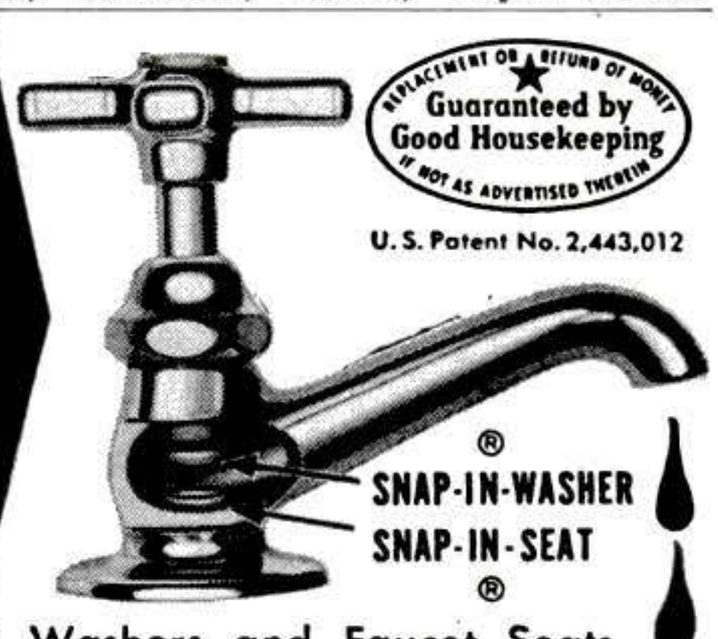

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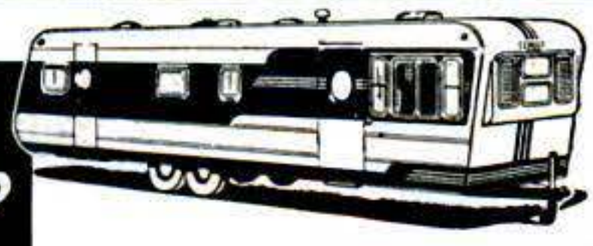

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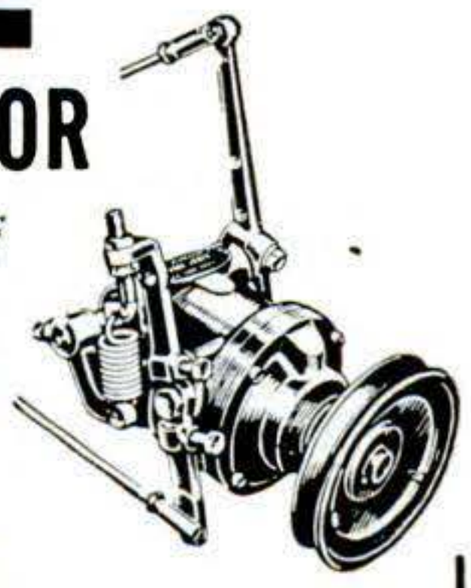

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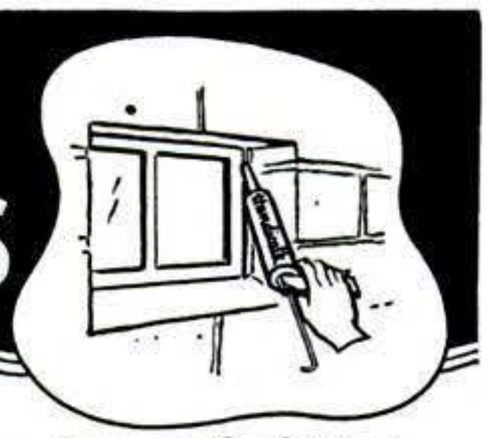

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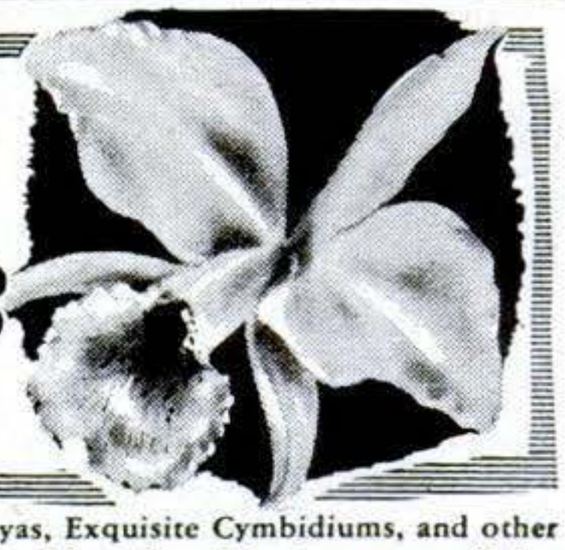

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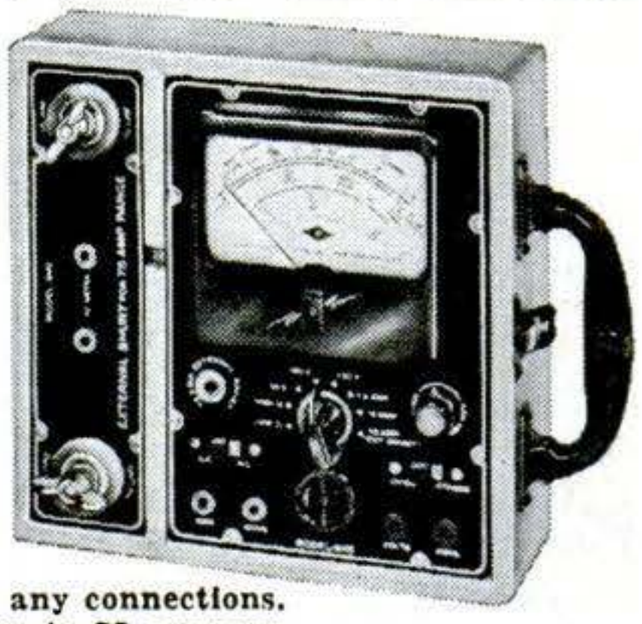

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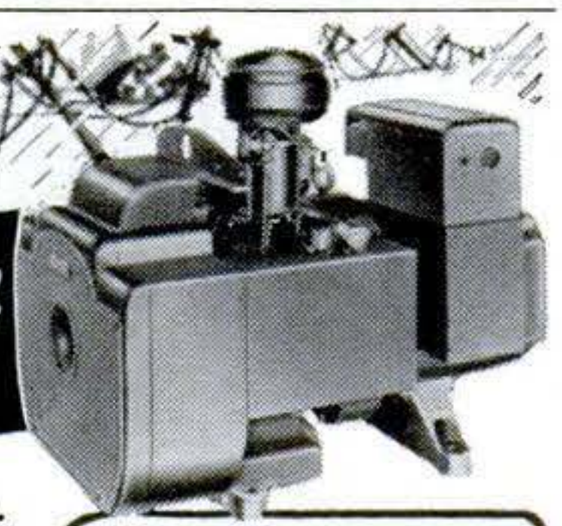

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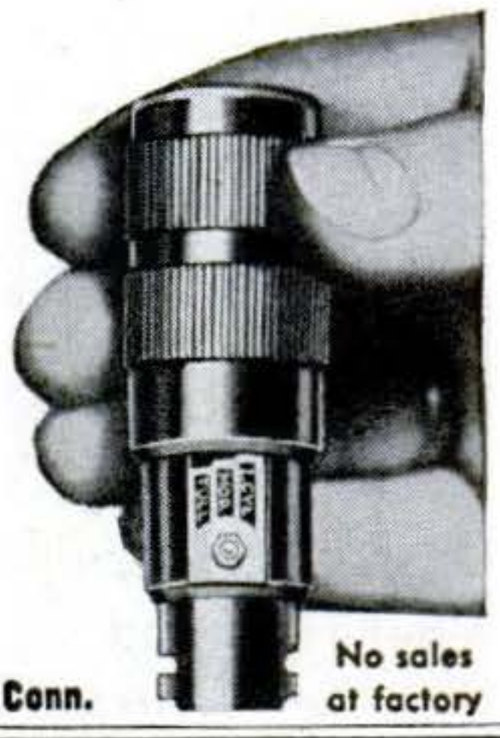

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By Wilbur Shaw

THREE years ago Chrysler brought out a sensational 180-horsepower hemispherical-head engine. All through 1952 and 1953, while other companies were boosting horsepowers, Chrysler coasted along on the same rating.

Now I've got news for you. For 1954 Chrysler is shooting up to a whopping 235 horsepower. That's exactly 100 hp. more than it had a mere four years ago. Announced last month, this car once again becomes the most powerful mass-production automobile in the world.

I paid a visit to the company's factory in Detroit tongue-in-cheek. These ever-increasing horsepowers, against a backdrop of ever-increasing accidents, have bothered me. Is there a good reason for so much moxie in a passenger car?

On a winding shore road by Michigan's Lake St. Clair I experienced one reason for it, and I'm going to pass it along to you. Then you can decide for yourself.

Chrysler's decision to advance its horsepower rating was purely arbitrary. The V-8 engine itself—described in some

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quarters back in 1951 as the biggest improvement in design in a quarter of a century—is capable of a lot more. The basic engine, in fact, has produced 400-odd horsepower experimentally. For 1954 the engineers could have shifted a few more things around and come up with 250 or 275 hp. without any trouble.

On the drive along the lake a fast panel truck was streaking ahead of me in the lane to my right. I had three people, besides myself, aboard a 1954 Chrysler New Yorker. I decided to pass.

Truck Creeps Over

Up to that moment the driver of the panel truck was behaving as any good driver should. He was keeping strictly to his lane. Behind me, another car intent on passing the truck, was riding my bumper.

Then things began happening. I had covered about a third of the truck's length on the left side when his front wheels began creeping into my lane. This was a perfect set of circumstances for a nasty highway accident. If I jammed on the brake, I stood a good chance of being rammed by the car behind. If I went on trying to pass, I could get sideswiped by the truck.

But if the car had the oomph, I might get out of the jam.

I mashed the accelerator. We fairly leaped ahead. My right rear fender cleared the truck's left front fender with only inches to spare.

"That," said one of the Chrysler engineers, "is where our high torque pays off."

I agreed.

As the horsepower has gone up, the torque has gone up with it. It was torque—the sudden added push at the rear wheels—that came to my rescue.

The 1953 New Yorker model required 20.7 seconds to accelerate from 40 to 80 miles an hour. The 1954 New Yorker requires only 13.7 seconds. And, as a matter of interest, the 1950 New Yorker, with 135 horsepower, required 24.4 seconds.

The torque produced has gone up from 270 foot-pounds in 1950 to 330 in 1954.

James C. Zeder, Chrysler's vice-president and director of engineering, sums it up this way: "We want to cut down the time that you're on the wrong side of the road when you're passing another car."

Whether or not you approve of the boost in horsepower, I'd like to credit Chrysler with a sensible suggestion that it has made to those guests who were privileged to drive the new car prior to its appearance in the salesrooms.

"We'd rather," I was told, "that you didn't mention the top speed. It could only lead to somebody's getting himself in trouble trying to see how good his car was by comparison."

I opened the car up—but I'm not telling how fast I went.

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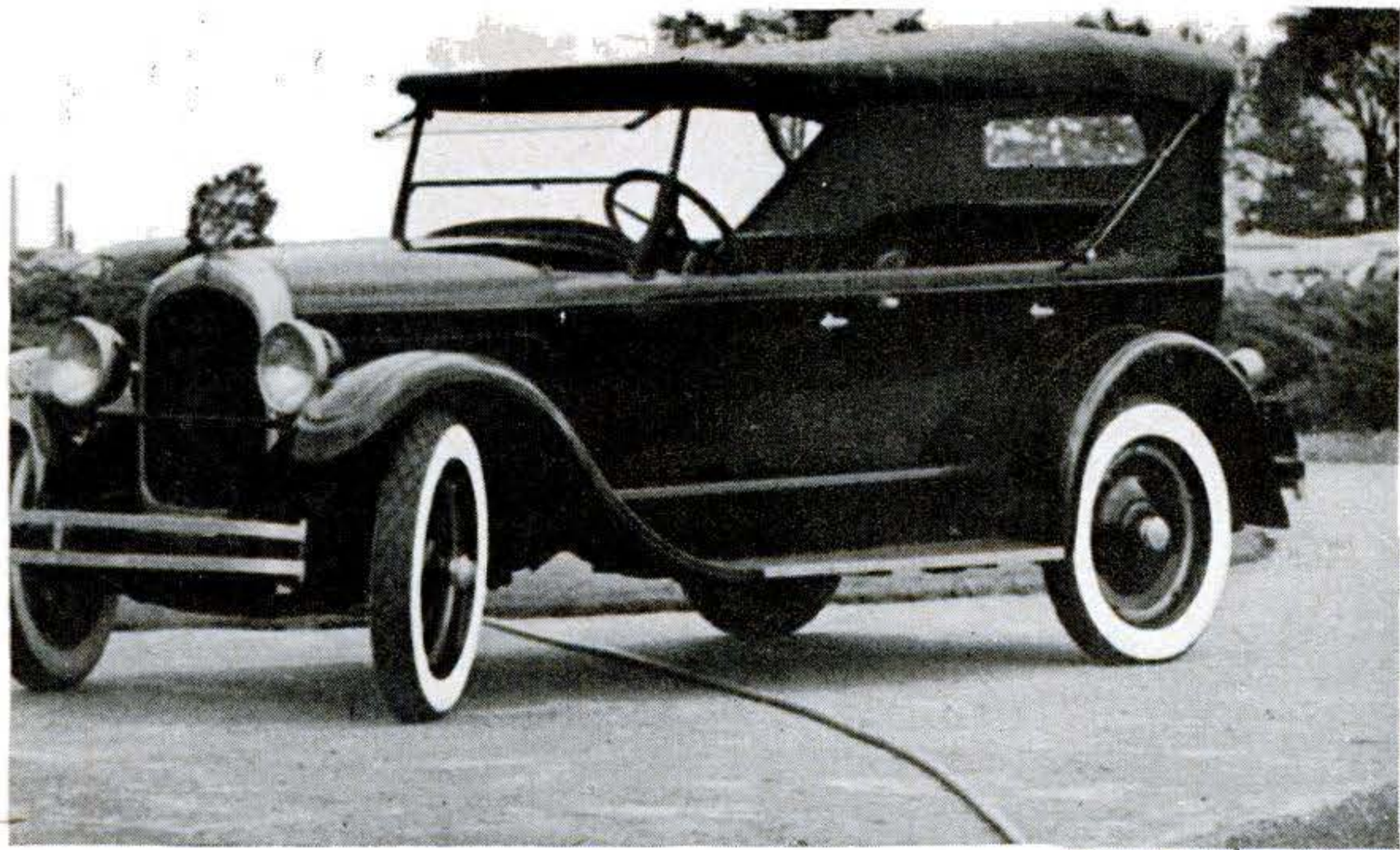
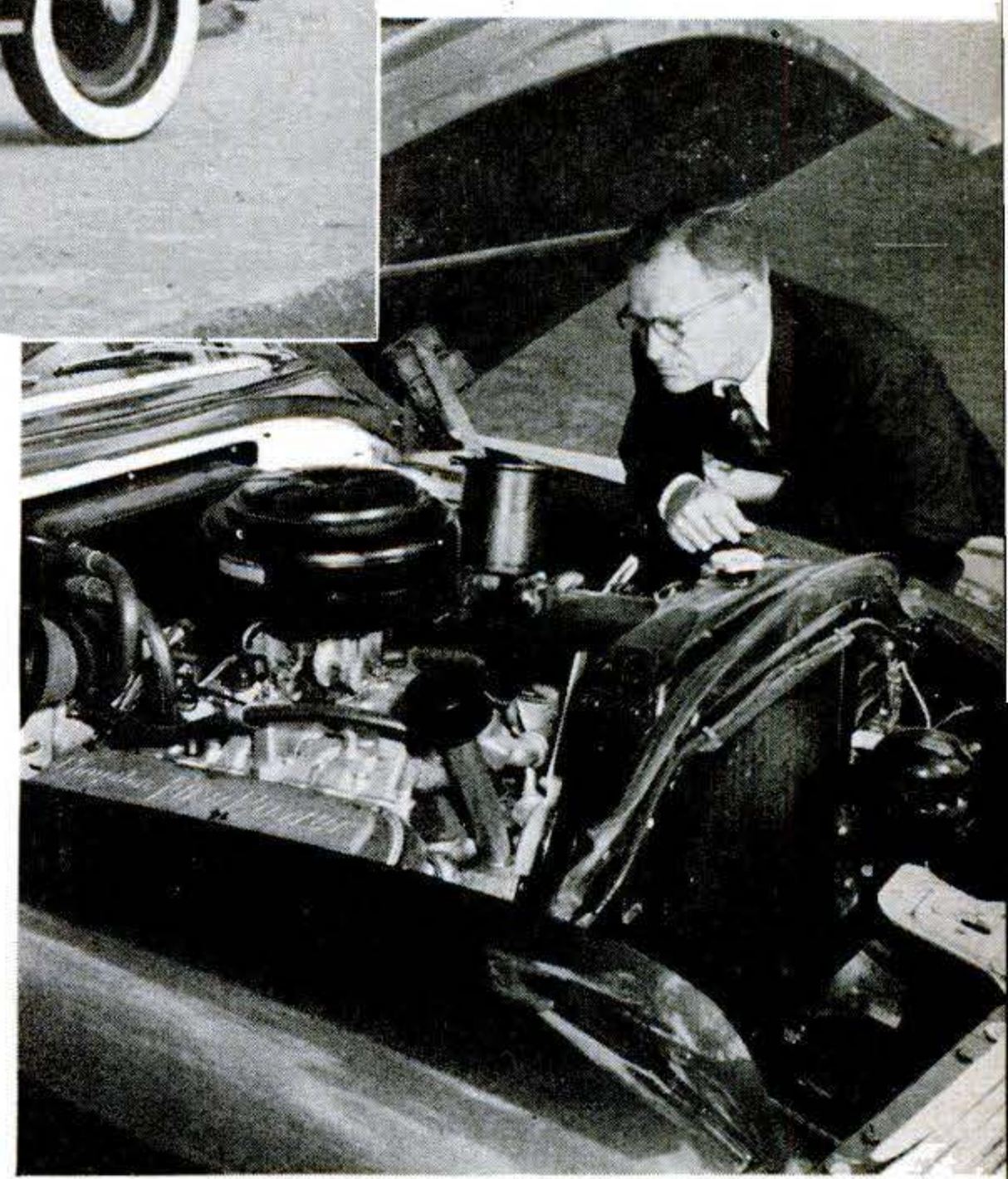


THE '54 JOB on the left can pull out and pass a car going 40 m.p.h. and get back in the right-hand lane—all in 310 feet. On the right is a 68-hp. 1924 Chrysler.

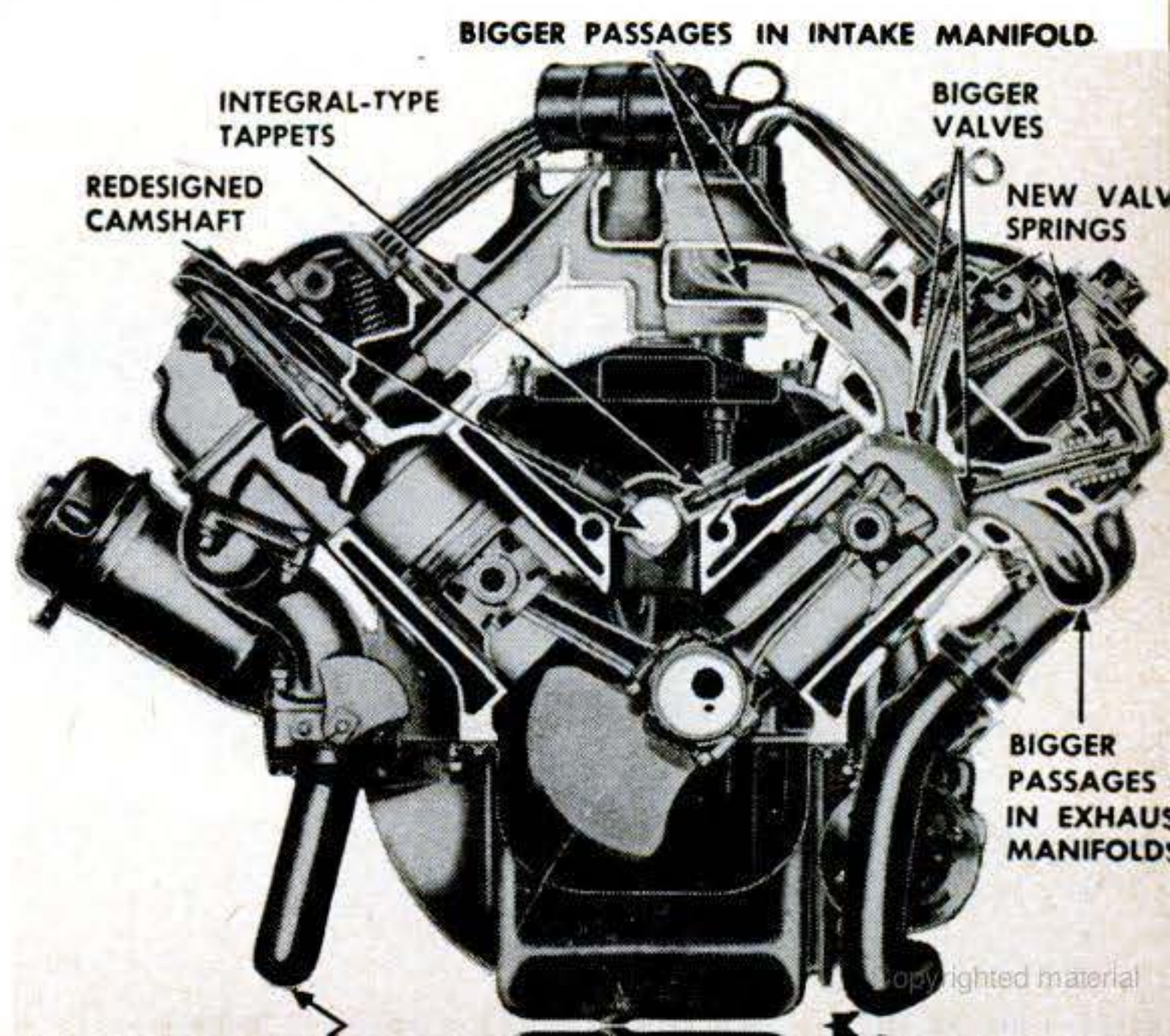


THE ENGINE still runs on nonpremium gas. The intake-valve diameters are 1.93 inches, compared to 1.81 in '53, and the exhaust valves are 1.75 inches compared to 1.50.

The fact is, the new Chrysler isn't a great deal faster than the 1951 job. It wasn't speed that the engineers were after. It was acceleration performance in the cruising range and—let's not forget—added power to run today's accessories. Power steering, automatic transmissions and air conditioning don't require a vast amount of power, but it would be pointless to penalize performance for them.

It takes a sharp eye to discover what has been done to improve the Chrysler's performance. There's a new four-barrel carburetor. There's new intake and exhaust manifolding and there are bigger valves to improve breathing. Waste gases are tunneled out through two tailpipes, one for each bank of cylinders, to reduce back pressure in the system. And there's a new camshaft that increases both the duration of valve lift and the overlap between the opening of the intake and exhaust valves.

THIS CUTAWAY shows the changes. The compression ratio is the same at 7.5:1. The torque effort is 330 foot-pounds at 2,600 r.p.m., compared with 312 at 2,000.



Increased Stability on Turns

The important engine changes are pretty subtle. Look under the hoods of the '53 and '54 Chryslers, and you can't tell the differences in the engines.

Other improvements have been made in the car. There's a new transmission, described by its champions as the best of its kind. (It was described in the September issue of POPULAR SCIENCE MONTHLY.) This transmission contrib-

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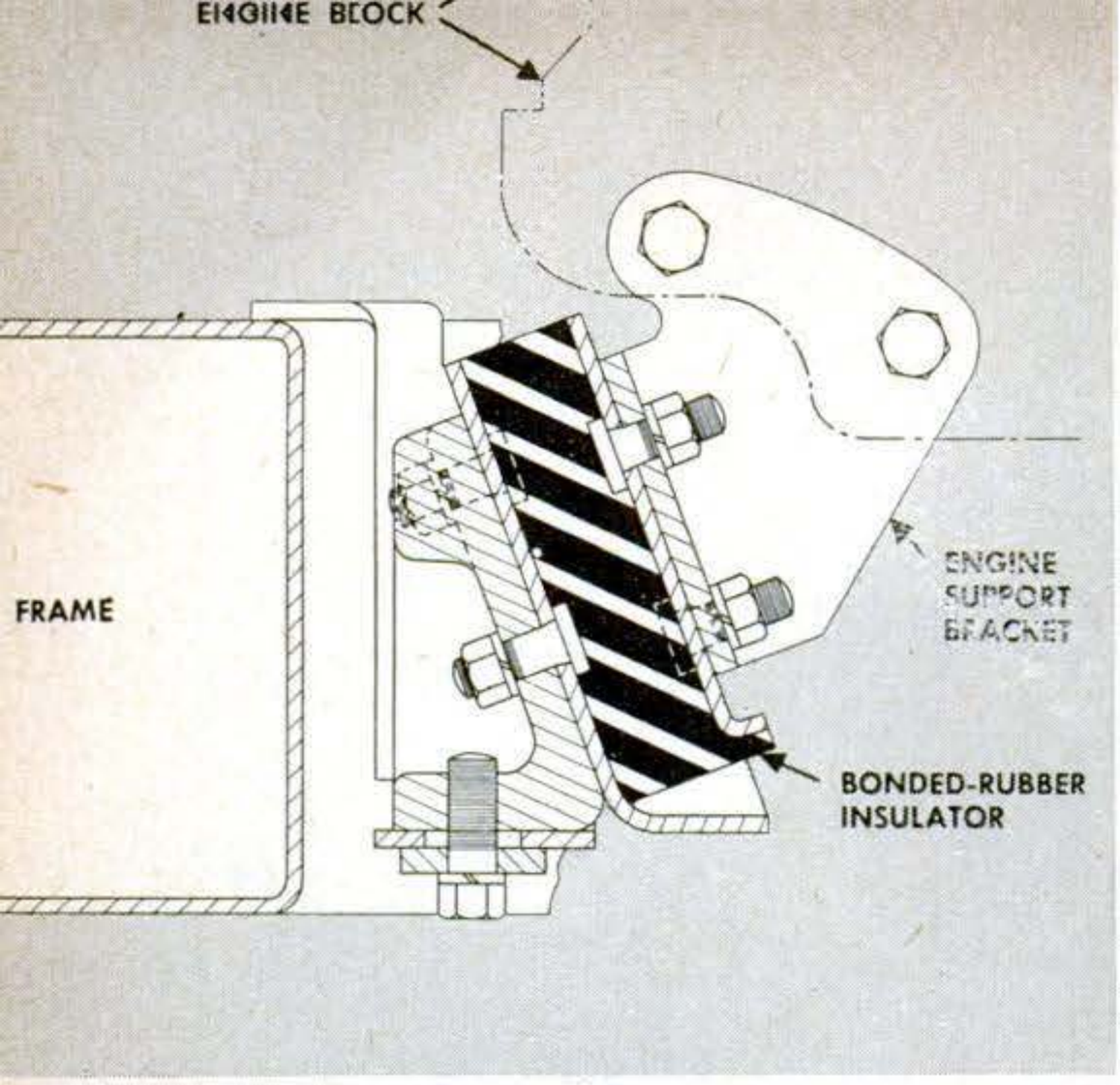


NEW SLANTING engine mountings insulate engine vibration from the frame better. Moreover, the rubber retains its elasticity. The car's roll center has been raised so that the body will lean toward the outside of a hard turn by 15 degrees less.

utes a lot, of course, to the car's performance.

There's a new front suspension to increase the stability on turns. And the "roll center" has been raised so the car won't lean away from a hard turn.

When you get behind the wheel of one of the world's really fine motor cars, automatically you begin looking around for the spots where the designers have goofed off. I thought I had found one when I began examining the height of the power-brake pedal. Braking, I had to lift my foot from the accelerator and bring it clear back to the point where the calf of my leg touched the seat cushion.

"Ah-hah," I said to myself, "what's this?"

The answer to that one lay in long-established Chrysler engineering policy. If you tell one of their engineers that the sun comes up in the east, he'll wait until sunrise and check it before he concedes, "It's a possibility."

A Reason for Long Brake-Pedal Travel

Chrysler was all set to install a power-brake pedal just the same height as the accelerator pedal when somebody said whoa! Reducing the pedal travel is the same thing as increasing the size of the master brake cylinder—when the power goes off, it's incredibly hard to brake the car with the leg muscles alone.

"Let's suppose," preached the man who called the halt, "that some guy is starting down a hill in heavy traffic and his engine dies. The torque converter won't let his rear wheels turn his engine over fast enough to maintain sufficient vacuum for his power brakes. With short pedal travel, where does that leave him?"

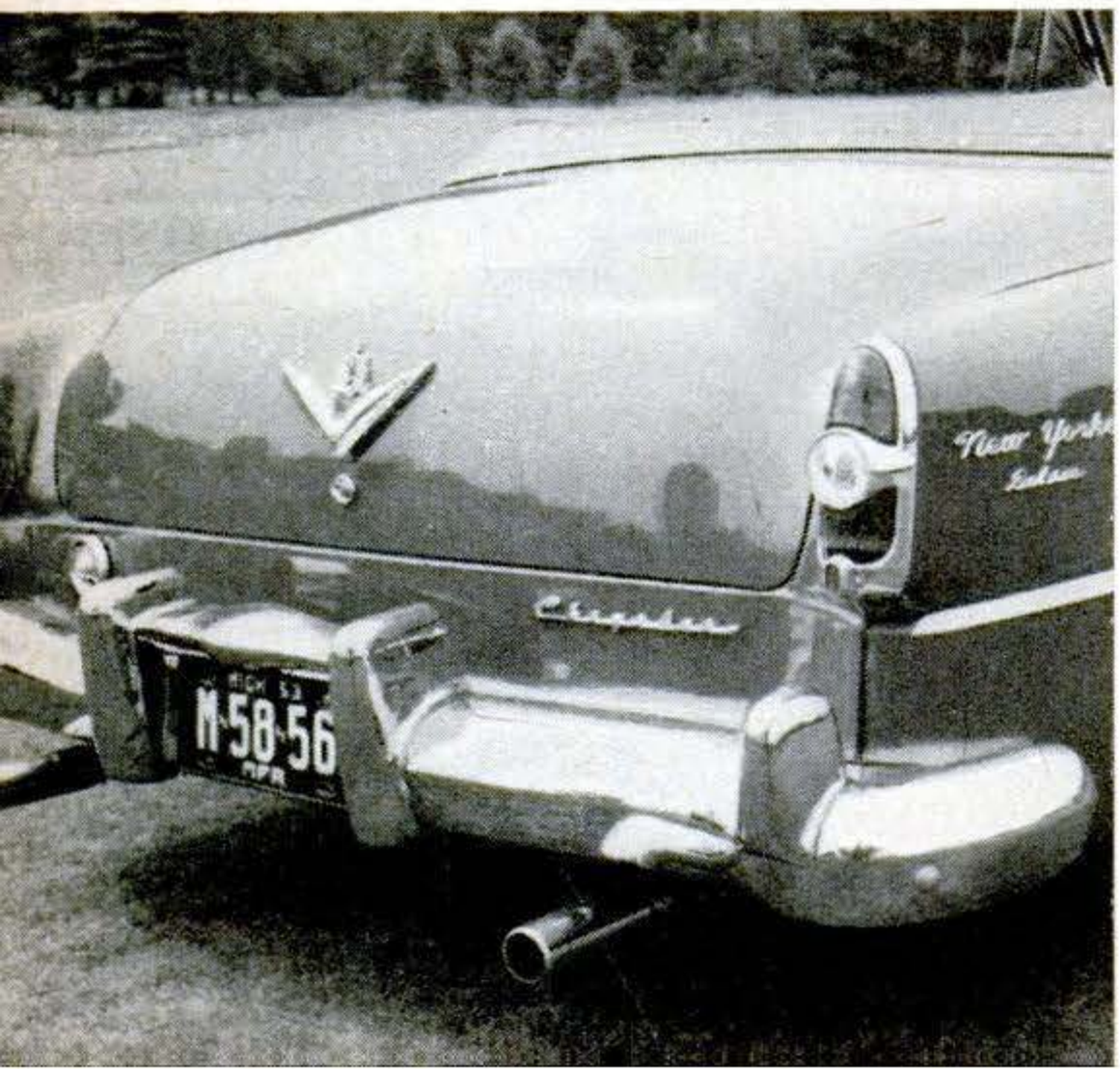
So Chrysler is going to study that one for a spell before it makes any change in its brake pedal—if, indeed, it does at all.

There's Headroom to Spare

But I did find something to squawk about. The Chrysler Corporation has got a lot of six-foot men in it, topside. They like to get into a car with their Homburgs on. Me, I'm average. The roof of the sedan is too high. The Chrysler seats are too big for anyone except men six feet tall with posteriors to match. One of these days I hope that Chrysler will discover that all potential car buyers aren't brothers of the center on the University of Michigan basketball team.

Power, the new Chrysler has—aplenty. I may regret these words, come next year, but I'm beginning to suspect that we're about reaching tops in engine power for ordinary driving, even in the most *chichi* of America's quality automobiles. Personally, I think it's time we did. END

TWIN EXHAUST PIPES tattletale the fact that it's a '54 Chrysler. Styling has been sharpened with stainless-steel trim except where castings are used. They're chromed.



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FACTS ON '54 CHRYSLER

Model: New Yorker DeLuxe convertible.

Engine: V-8 with overhead lateral valves; 235 hp. at 4,400 r.p.m.; compression ratio, 7.5:1; piston displacement, 331.1 cu. in.; bore and stroke, 3 13/16" by 3⅜"; piston travel (in feet per car mile at 30 m.p.h.), 1,437; crankshaft bearing surface, 43.8 sq. in.; torque, 330 lb.-ft. at 2,600 r.p.m.

Weight: 4,595 lb. (approx.); per hp., 19.5 lb.

Transmission: torque converter with planetary gearbox; rear-axle ratio: 3.36:1.

Steering ratio: 16.2:1 (with power steering); radius of turning circle, 21' 9".

Effective brake-lining area: 201.1 sq. in.

Springs: front, coil; rear, semi-elliptic.

Outside dimensions: height (to top of windshield) 59 9/16"; over-all length with bumpers and guards, 215⅝"; width, 76¾"; wheelbase, 125½"; overhang, front 37⅜", rear 52¾"; tread, front 56 5/16", rear 59⅝".

Inside dimensions: seat-cushion width, front 58", rear 49¼"; leg room, front 43¾", rear 39⅜"; seat height, front 14⅜", rear 14½"; vertical distance, steering wheel to seat cushion with seat in mid-position, 5⅜"; front-seat adjustment, horizontal 5", vertical 1⅛".

Tire size: 8.00 by 15.

Pictures of new Plymouth and Dodge on next page.

FACTS ON '54 PLYMOUTH

Model: Belvedere four-door sedan.

Engine: 6-cyl. L-head; 100 hp. at 3,600 r.p.m.; compression ratio, 7.1:1; piston displacement, 217.8 cu. in.; piston travel (in feet per car mile at 20 m.p.h.), 2,040; bore and stroke, 3¼" by 4⅜"; torque, 177 lb.-ft. at 1,200 r.p.m.

Weight: 3,185 lb. (approx.); per hp., 31.85.

Transmission: 3-speed manual shift, with or without overdrive; or torque converter with 3-speed transmission. Rear-axle ratio, 3.73:1 (standard); 4.41:1 (overdrive).

Steering ratio: manual, 21.1:1 over-all; power, 19.7:1 over-all. Radius of turning circle: 19½'.

Effective brake-lining area: 158 sq. in.

Springs: front, coil; rear, semi-elliptic.

Outside dimensions: height, 61¾"; over-all length with bumpers and guards, 193½"; width, 74¼"; wheelbase, 114"; overhang, front 32", rear 47½"; tread, front 55⅞", rear 58½".

Inside dimensions: seat-cushion width, front 59¾", rear 58¾"; leg room, front 43¾", rear 43⅜"; headroom, front 36⅝", rear 35⅛"; seat height, front 14⅜", rear 15"; front-seat adjustment, horizontal 5", vertical 1⅛".

Tire size: 6.70 by 15.

FACTS ON '54 DODGE

Model: Royal V-8 four-door sedan.

Engine: 8-cyl. inclined lateral valve-in-head; 150 hp. at 4,400 r.p.m.; compression ratio, 7.5:1; piston displacement, 241.3 cu. in.; piston travel (in feet per car mile at 20 m.p.h.), 1,408; bore and stroke, 3 7/16" by 3¼"; torque, 222 lb.-ft. at 2,400 r.p.m.

Weight: 3,585 lb.; per hp., 23.9.

Transmission: torque converter and automatic transmission; or 3-speed manual shift with or without overdrive.

Steering ratio: manual, 22.2:1 over-all; power, 20.4:1 over-all. Radius of turning circle, 20' 8".

Effective brake-lining area: 173½ sq. in.

Springs: front, coil; rear, semi-elliptic.

Outside dimensions: height (loaded), 62"; over-all length with bumpers and guards, 205½"; width, 74¼"; wheelbase, 119"; overhang, front 34⅝", rear 51⅞"; tread, front 55 15/16", rear 58¾".

Inside dimensions: seat-cushion width, front 60", rear 60½"; leg room, front 43⅛", rear 39"; headroom, front 36¼", rear 36"; seat height, front 14¾", rear 14¼"; vertical distance, steering wheel to seat cushion with seat in mid-position, 5¾"; front-seat adjustment, horizontal 5", vertical 1⅛".

Tire size: 7.10 by 15.

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'54 Plymouth Is Longer, Offers Power Steering

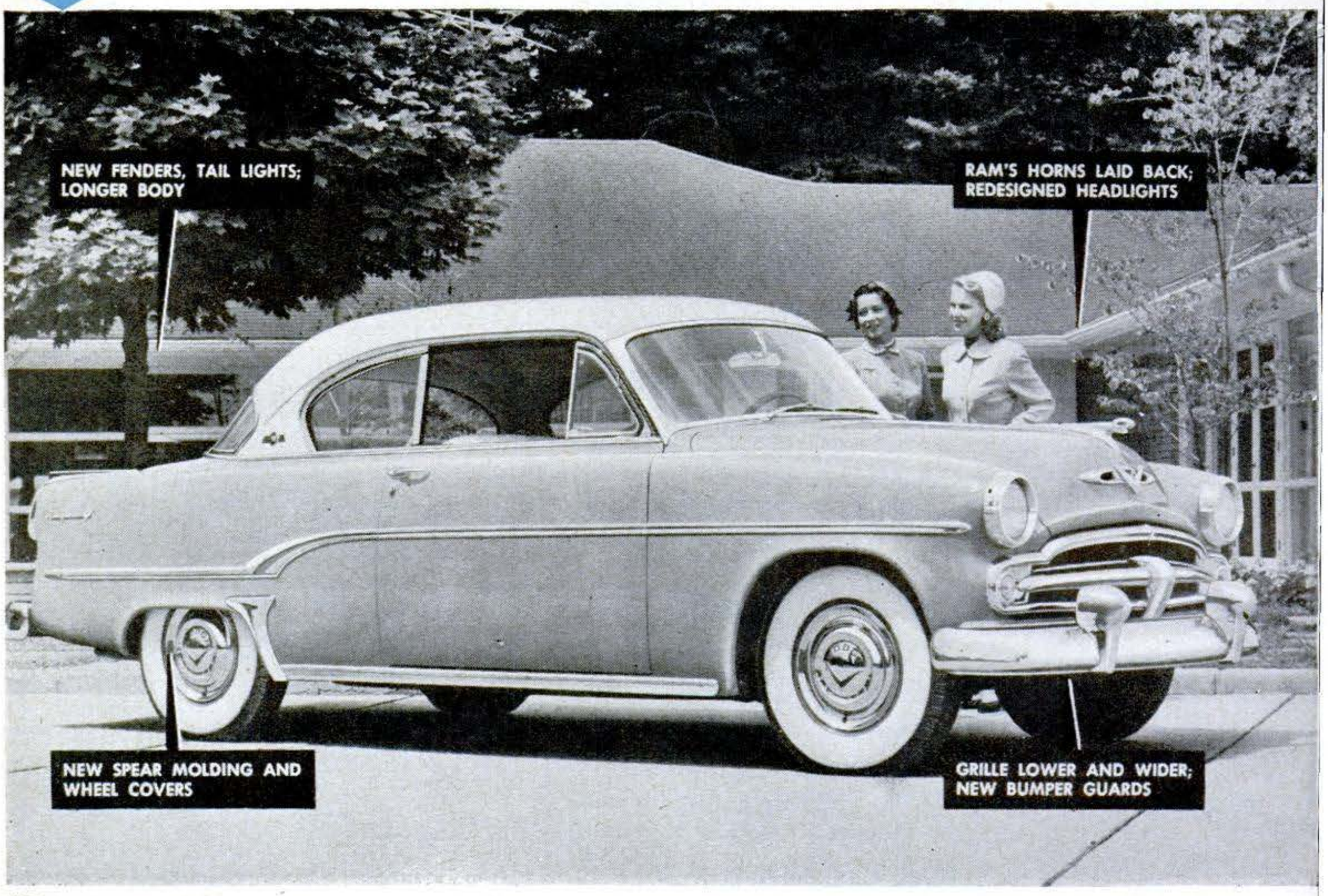
OPTIONAL linkage-type power steering, a 3⅝-inch increase in over-all length and a variety of small style and engineering changes mark the newly announced 1954 Plymouths.

Plymouth's power-steering unit, manufactured by Monroe, comes into play when one pound of steering effort is applied to the rim of the 17½-inch wheel. The hydraulic-assist mechanism reduces steering effort up to 80 percent.

Styling changes are highlighted in the recognition features listed at right. Interiors have been dressed up with new vinyl fabrics. Springs in the seat cushions have been modified to give softer riding on smooth roads but greater resistance to bottoming on rough ones.

Mechanical changes include a new alloy steel for intake valves, an improved clutch and more capacity for the oil pump.

HOW TO TELL THE NEW MODELS



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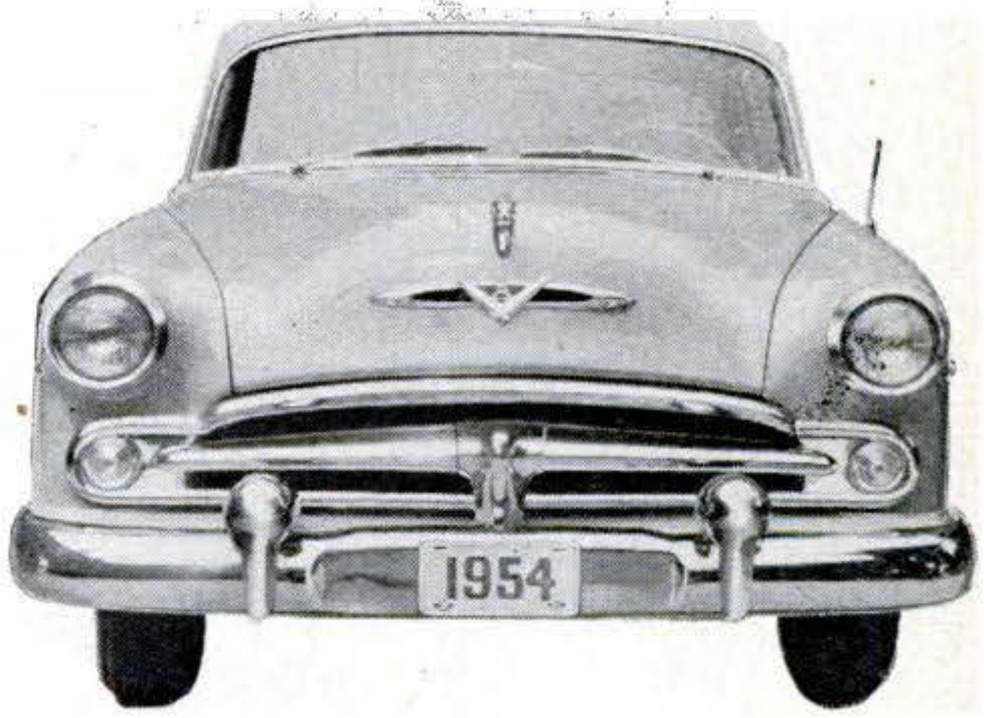
NEW HOOD ORNAMENT; REDESIGNED HEADLIGHTS

NEW TAIL LIGHT AND FENDER ORNAMENT

DIFFERENT GRILLE AND BUMPERS

LONGER BODY; NEW SIDE MOLDING

Dodge Gets New Transmission, 10 More Horsepower



TEN more horsepower on the V-8—achieved by boosting compression from 7.2 to 7.5—a new fully automatic transmission, and power steering are highlights of the 1954 Dodge. The cars also sport some styling changes (left).

The compression rise is the principal change on the V-8 engine, which has a distributor with a slightly different advance curve. Meadowbrook models of the V-8 continue at 140 hp. Power of the L-head six has been raised to 110 hp. and compression to 7.25.

The new PowerFlite transmission is identical with the one announced this year by Chrysler (PSM, Sept. '53, p. 116). It combines a high-multiplication torque converter with a fully automatic two-speed gearbox. There is no clutch pedal.

Power steering on Dodge is of the linkage type, with assist occurring as soon as one pound of effort is put on the wheel.

A new super de luxe series, the Royal V-8, heads the line. Models come in 11 body colors and 14 two-tone combinations, with restyled interiors and Jacquard fabrics. If you really want to shoot the wad, you can get air conditioning.

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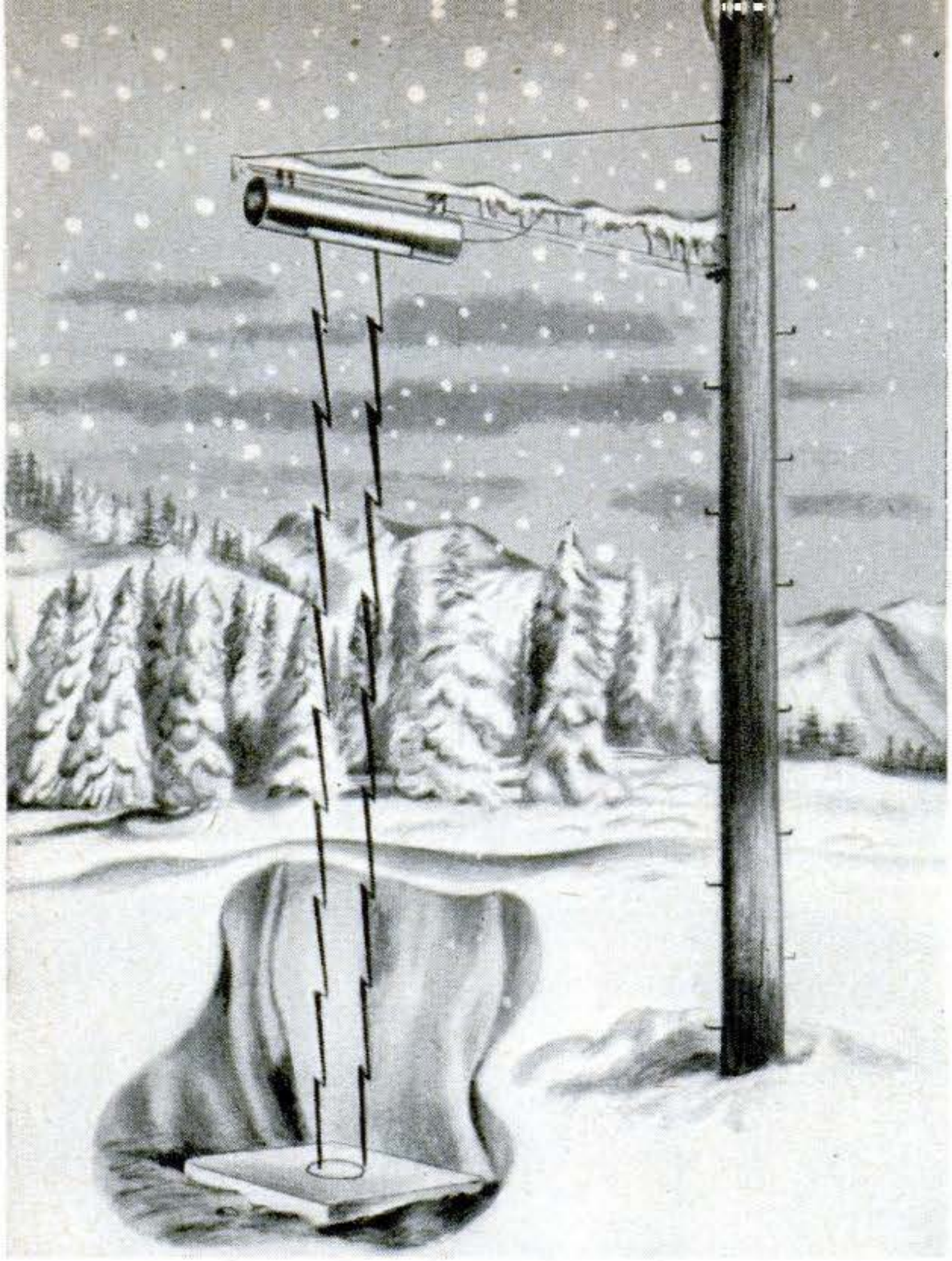


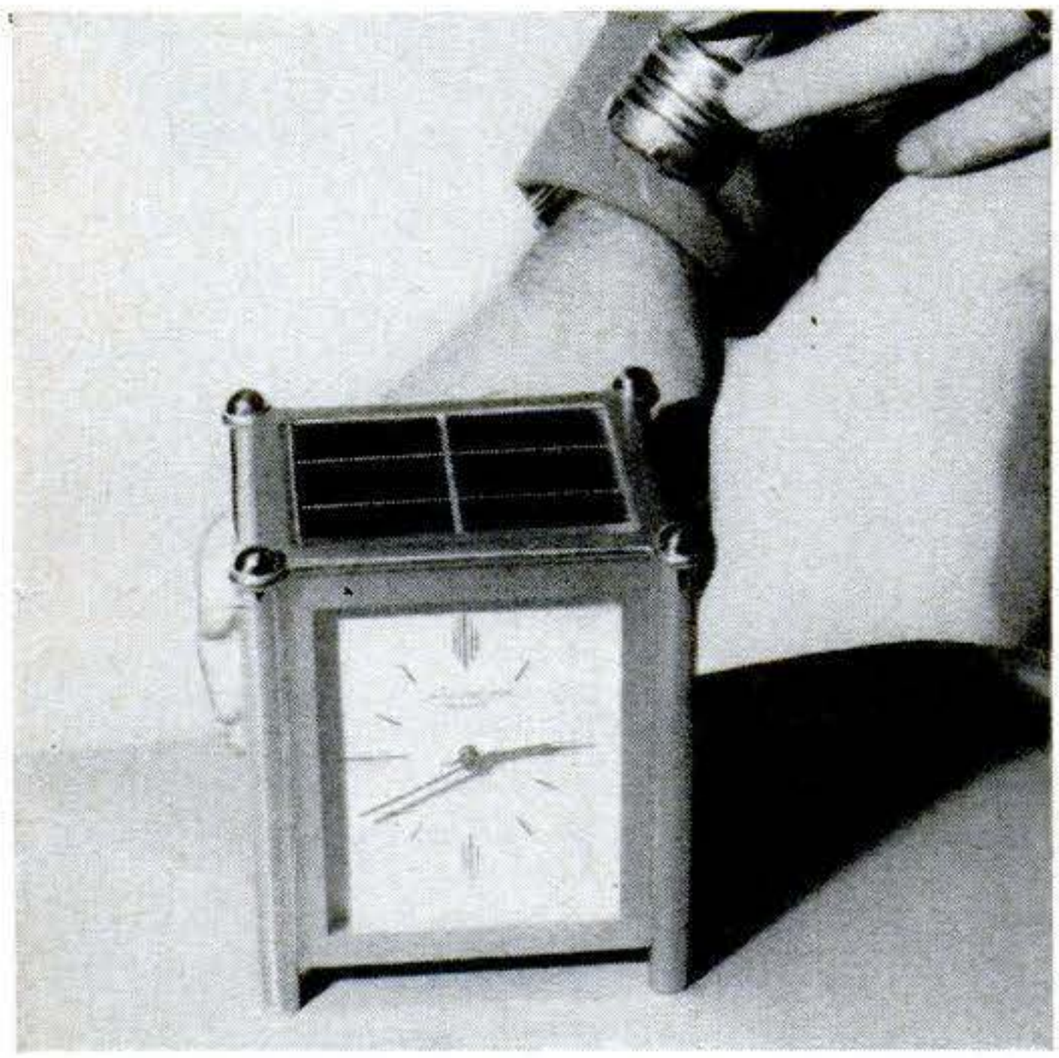
Hot Atoms Gauge Snowfall

RADIOACTIVE isotopes now report the water content of snow at remote points in California mountains. Once a day each isolated station automatically radios in its report, permitting accurate forecasts of how much water will be available for irrigation and power.

Cobalt-60, which emits gamma rays, is buried in concrete flush with the ground. Fifteen feet above it a Geiger-Mueller tube is hung from a pole. As snow piles up, it cuts off part of the gamma rays received by the tube. The more water in the snow, the more rays are blocked. The device measures the rays received and turns them into code signals that are sent on a fixed schedule to a recording center. There the signals are automatically decoded and the water content noted.

Light Makes This Clock Run

A FLASHLIGHT is "winding" the clock below. Light falling on a photoelectric cell generates electricity to drive a tiny motor. This motor winds the mainspring. One of the first successful examples of turning the energy of light into electrical energy for useful work, the novel Swiss clock can store up enough power in one hour's exposure to natural or artificial light to run it for a full day.



Inside Moisture Measured

WITH all sorts of equipment sealed against corrosion, the armed forces need to know from time to time how the moistureproof packaging is doing its job. One device used is the Hydrotector, developed by the American Instrument Co. It consists of an electronic sensing device sealed in the package but with an outside connection. A portable meter, when pushed against this connection, reports the inside humidity.

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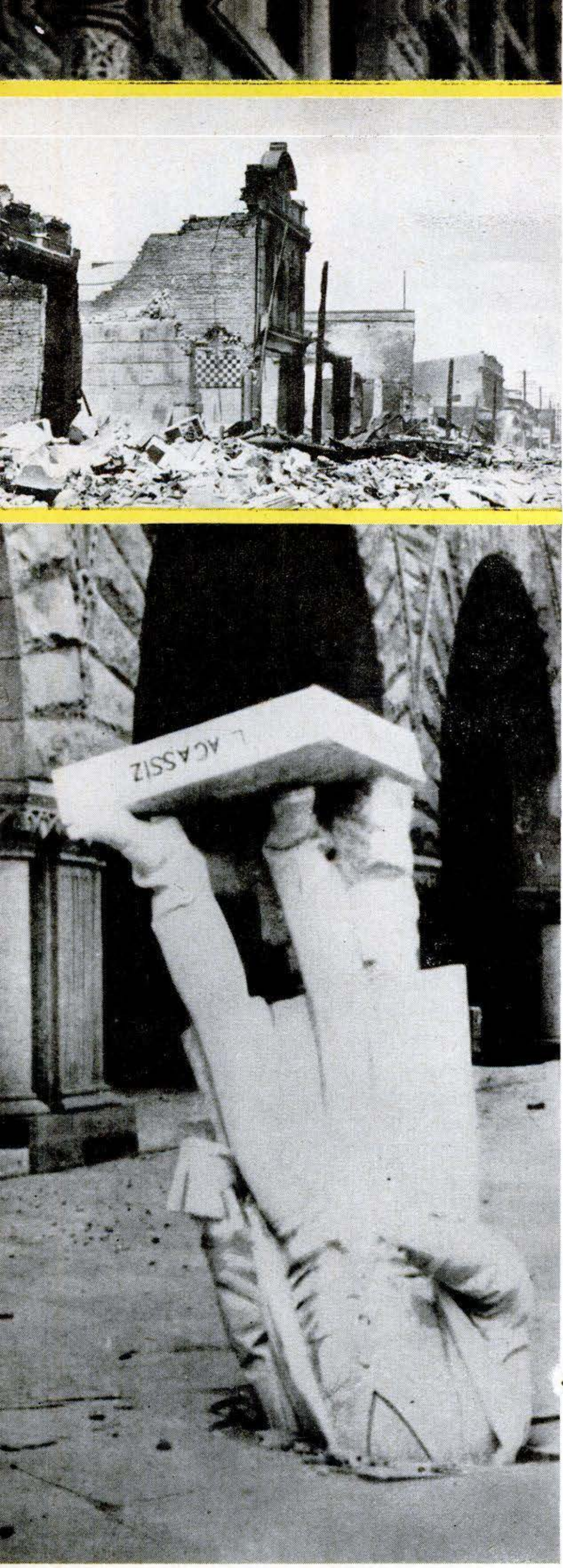

Can We Predict Earthquakes?

Scientists now believe a day is coming when death caused by temblors can be prevented.

By James N. Miller

FOR scores of years, men of science have sought in vain to develop a way to predict earthquakes before they vent their fury. Success is now in sight.

Federal seismologists have developed and tested two new devices for forecasting the havoc wrought by such monstrous disturbances of the earth's crust as the series of quakes that laid waste several Greek islands last summer or the tidal waves that occasionally sweep walls of water over coastal towns.

These lifesaving devices are the "seismic alarm clock" and the "tiltmeter." A third, promising even more detailed predictions at some future time, is a super-precise earth-strain gauge now being built into a California hillside.

The alarm clock already has proved its value. Last November a big seaquake (an earthquake under the sea) occurred in the far western Pacific. The alarm clock reported it. Scientists were able to forecast its effects hours before it set up violent waves that crunched on to Hawaii

MOST DEATHS and injuries in earthquakes are caused by falling debris, of which picture at top left is eloquent. It shows remains of shopping center in Napier, N. Z., after quake. Statue (lower left) was toppled in '06 San Francisco quake. Goal of seismologist is to warn people of impending shock in time to let them flee to safety.

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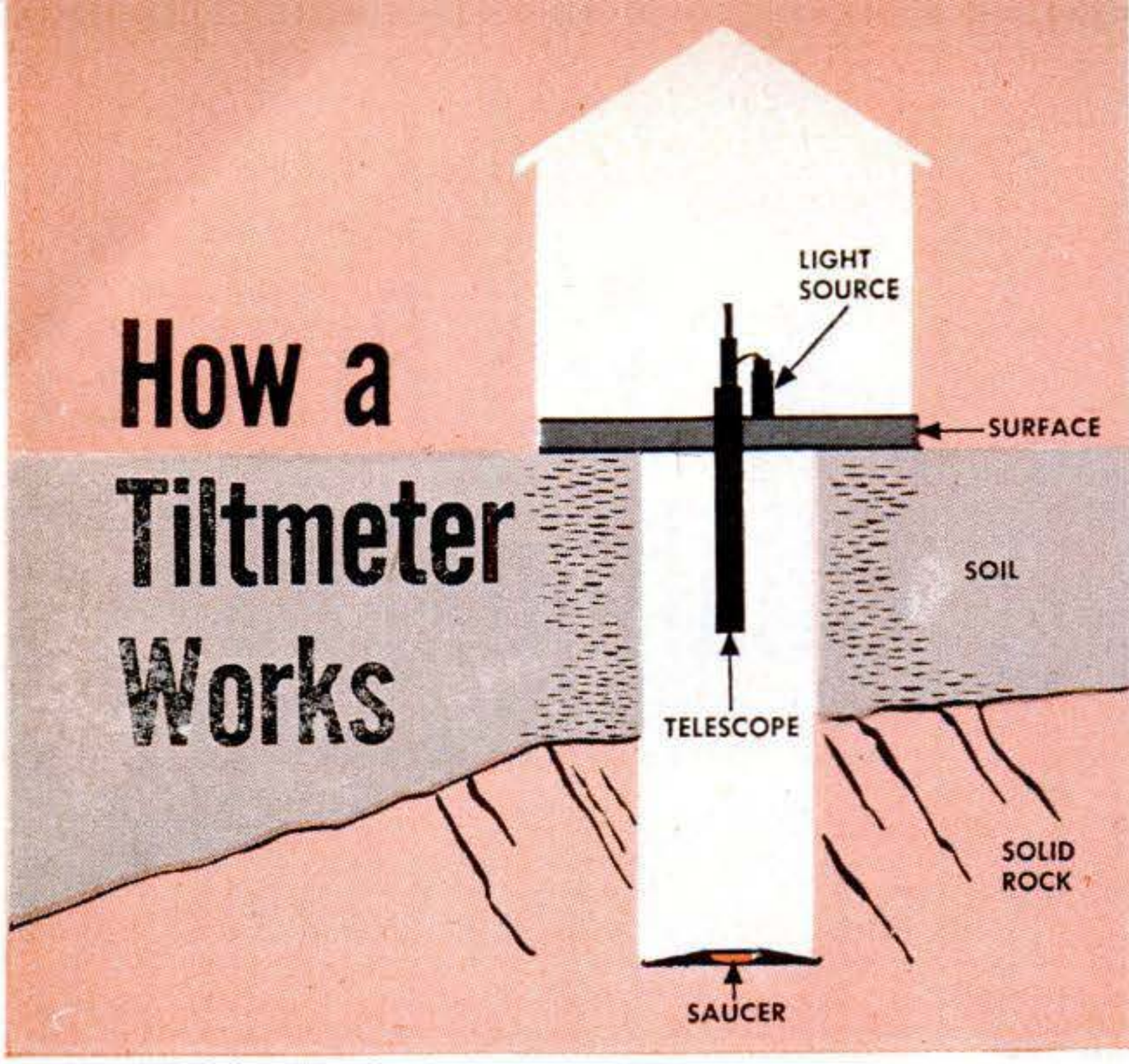

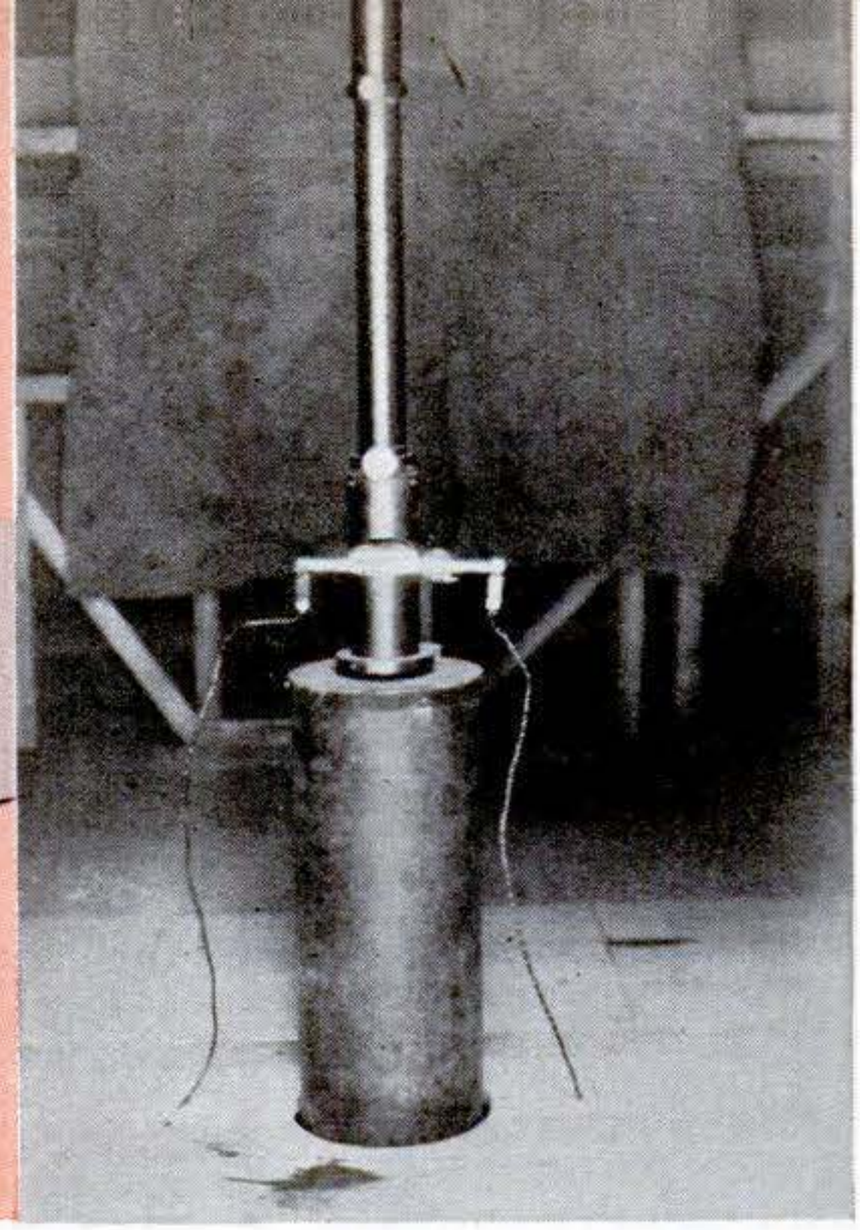

TILTMETER is simple, as cutaway drawing shows. Saucer has cover that tilts with it. Light is reflected both from surface of liquid and from inside face of cover. Rays, viewed through telescope (right, above) interfere with each other to create "fringes." These are interpreted as tilting of rock platform. Quake forecasts depend on rate of tilting.

and Midway Island. Residents fled to higher ground. No one was hurt.

The tiltmeter does the same job on land. It senses microscopic changes in the level of the earth's substrata that might herald a major disturbance. It is the scientist's equivalent of the tilt light on a pinball machine.

Where the tiltmeter measures vertical displacement of the earth's crust, the new strain gauge, designed by Dr. Hugo Benioff of the California Institute of Technology, will measure horizontal disturbances.

By keeping a log of the strains recorded by several such gauges over many years, and noting the patterns of strain that appeared just before a particular earthquake occurred, Dr. Benioff hopes to be able to predict not only when and where quakes may be expected but also their intensity.

Just What Is an Earthquake?

An earthquake is one of nature's most majestic and terrifying phenomena. But just what is it? It's a sudden rupturing of the earth's crust, generally 10 miles or more below the surface. Nearly all quakes result from slippage between layers of rock along a "fault," a crack. These faults may be vertical or horizontal. They may be a few miles long—or hundreds of miles long.

The amount of slip in a single quake has been as much as 47 feet vertically, as in an Alaskan quake in 1899, or 21 feet horizontally, as in the San Francisco quake of 1906.

Quakes strike practically anywhere. The rim of the Pacific, from Chile clear up, around and down to New Zealand, abounds with them. But Turkey has them too, and so do New York City, Kansas, Ohio, Oklahoma, Tennessee and the St. Lawrence River valley, among other places. The latest quake in the New York area occurred only last August. New York's biggest shock, in 1884, cracked building walls.

Both the alarm clock and the tiltmeter were developed by the Coast & Geodetic Survey. With them, it may be possible to forecast a quake or ensuing tidal wave a half-hour to five hours before it strikes.

Officially, the seismic alarm clock is known as an electronic visible recorder. It sets off an audible alarm and lights up every time a big seaquake is recorded.

One of the alarm clocks has been installed in the basement of the Com-

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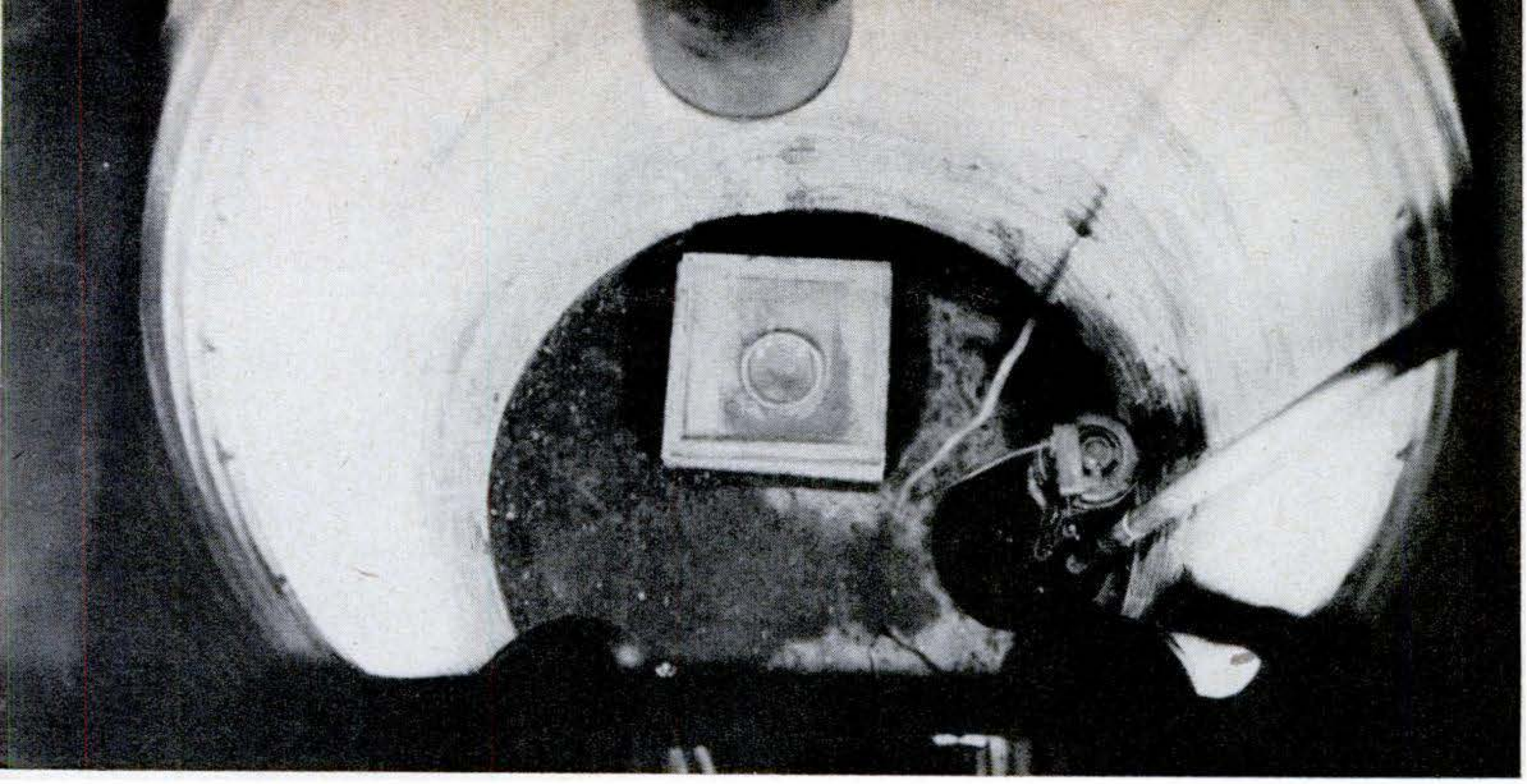

LOOKING DOWN INTO PIT, saucer is at center, light source at right, telescope at top of photo. Putting saucer on bedrock prevents false readings from purely local causes.

merce Department building in Washington, in the office of Capt. Elliott B. Roberts, chief of the division of geophysics, U. S. Coast & Geodetic Survey. There are two in Alaska, one at Tucson, Ariz., and one in Hawaii.

How the Alarm Clock Works

The electronic recorder consists of a galvanometer (an instrument for measuring small amounts of electric current), a seismometer (for recording movements of the earth during a quake) and an electric pen. Roger Wilson, who designed the pen for the Survey, explains the clock's operation this way:

When a seaquake occurs, its "fingerprints" are registered on the seismometer. A light beam reflected from a mirror on the galvanometer moves accordingly and strikes a photoelectric cell. Amplified, the output of the cell actuates the pen recorder. That makes the record permanent for study.

The alarm-clock feature operates like this: an auxiliary photoelectric cell, actuated when the light beam approaches the end of its swing, sets off the audible and visible signal. These signals are sounded and flashed in the station a few minutes after a seaquake occurs.

The development of the tiltmeter, the other device, goes back to the late Thirties when a Japanese seismologist named Ishimoto made an odd discovery. He found that shortly before a great earthquake of a certain type strikes, there is a tilt in the earth's surface.

Since Ishimoto's discovery American seismologists have been looking into the matter, and not so long ago Dr. George E. Merritt of the National Bureau of Standards built a tiltmeter for the Survey. The device showed such promise that four meters have been set up in California.

More than one tiltmeter is desirable so that their reports can be checked against each other. Two are used at a recording station in Berkeley, Calif., jointly operated by the Survey and the University of California.

Shortly after these meters were installed, a minor quake struck. The meters telegraphed its coming. Federal seismologists emphasize that it may require a long time to determine whether such observations are as important in forecasting quakes in this country as they are claimed to be in Japan.

The third and newest quake-sensing instrument, Dr. Benioff's earth-strain gauge, consists mainly of a quartz rod, two inches thick and 79 feet long, sticking out from a six-foot concrete pier sunk

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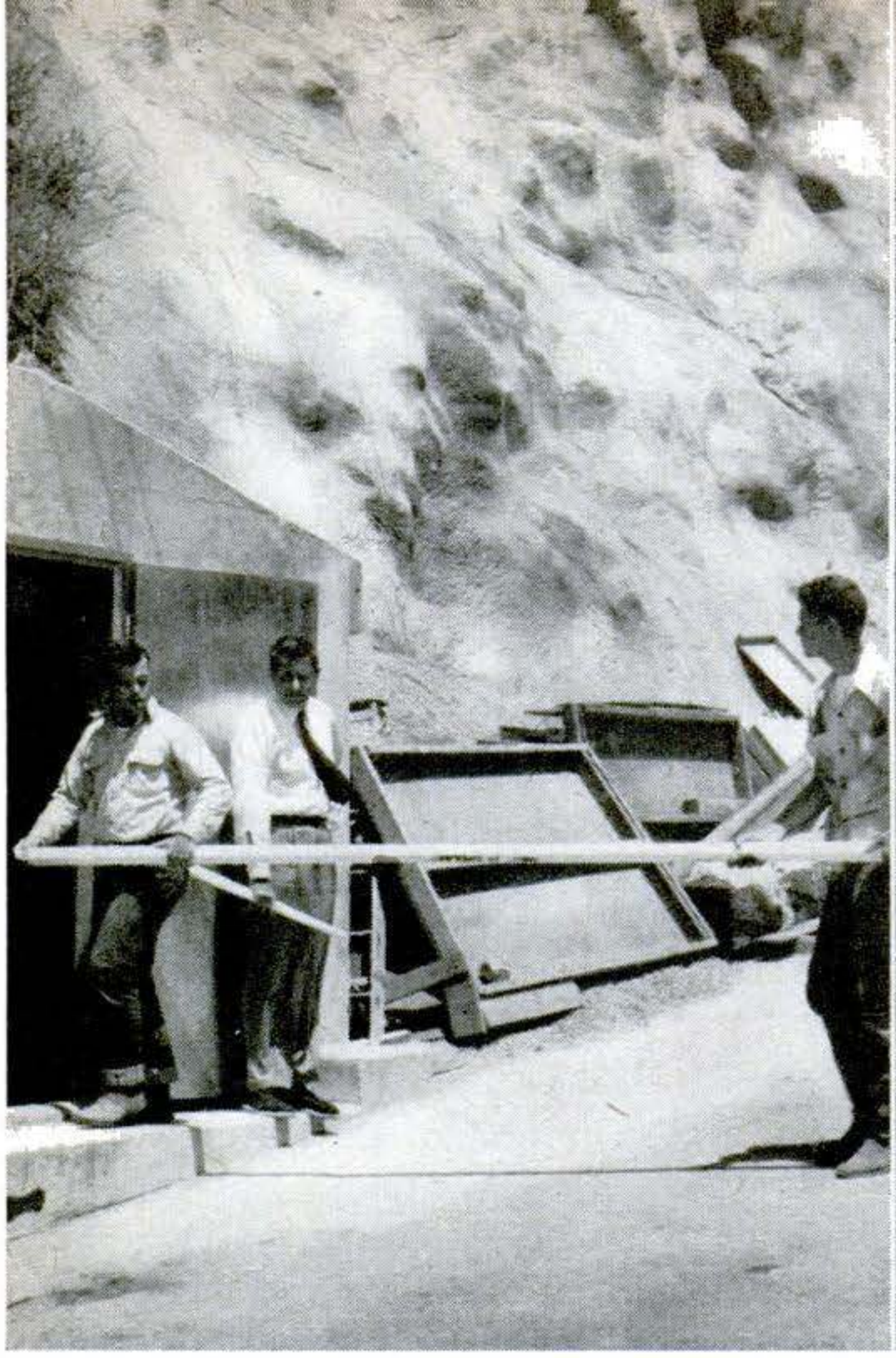
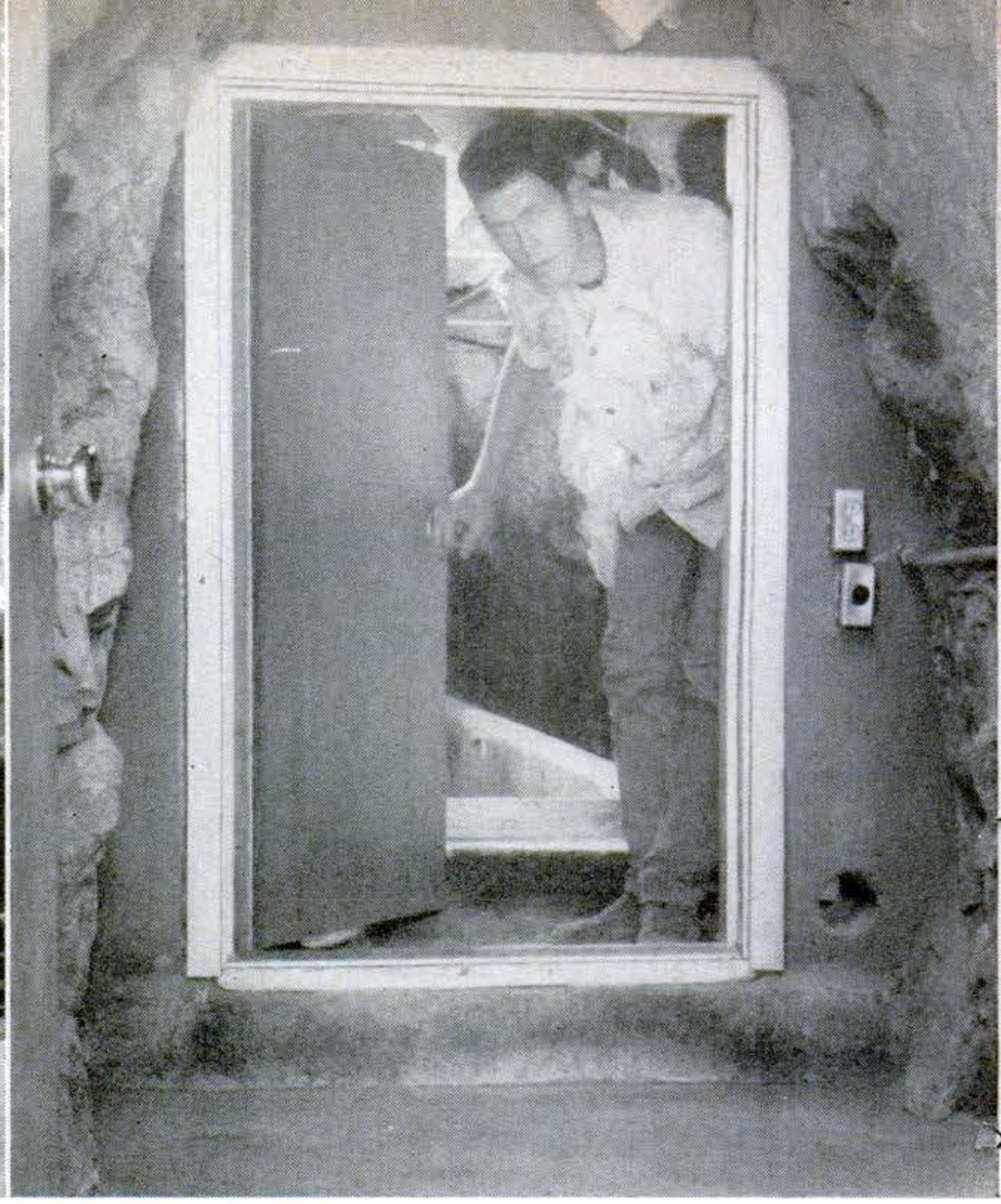


SECTION OF QUARTZ ROD for earth-strain gauge is carried into tunnel near Glendora, Calif.



SECOND DOOR, inside tunnel, shields instruments from sudden changes in temperature.

into the rocky floor of a tunnel below California's Big Dalton Dam.

The other end of the rod will hang free, cradled in fine wires, but will extend just above a second pier built into the rock. This second pier will serve as the base of a microscope focused on the free end of the rod and hooked up to electronic instruments that will measure its slightest quiver.

These instruments thus will note any differences in distance—as little as one 10,000th of an inch—between the two piers caused by horizontal movement of the earth's crust as strains build up toward quake intensity.

While earthquakes happen all over the world every day—few are destructive—the quake areas of California fascinate seismologists because of the wealth of fissures in the basement rocks.

1906 Quake Killed 700

A slippage of 21 feet along the San Andreas fault, or crack, in 1906 caused the violent shock that, with fire, killed 700 people in San Francisco and caused damage of $400,000,000.

Survey geologists report that since the 1906 quake there has been a "differential movement of 10 feet on the east side of the San Andreas fault as compared to the land to the west of the fault." That means, the scientists explain, that someday this accumulating strain will have to be relieved by another quake, perhaps as violent as the one in 1906.

Science doesn't positively know why cracks occur in the earth's crust. One theory holds that the principal cause is a creeping motion of the basement rocks, extending to depths of 30 miles or more. Since the motion isn't uniform, it sets up powerful stresses that cause the rock to rupture.

Another theory attributes the cracks to the shifting of millions of tons of earth from one place to another through erosion and sedimentation.

Whatever the cause of faults, when slippage occurs gigantic, convulsive waves are started. They go clear through

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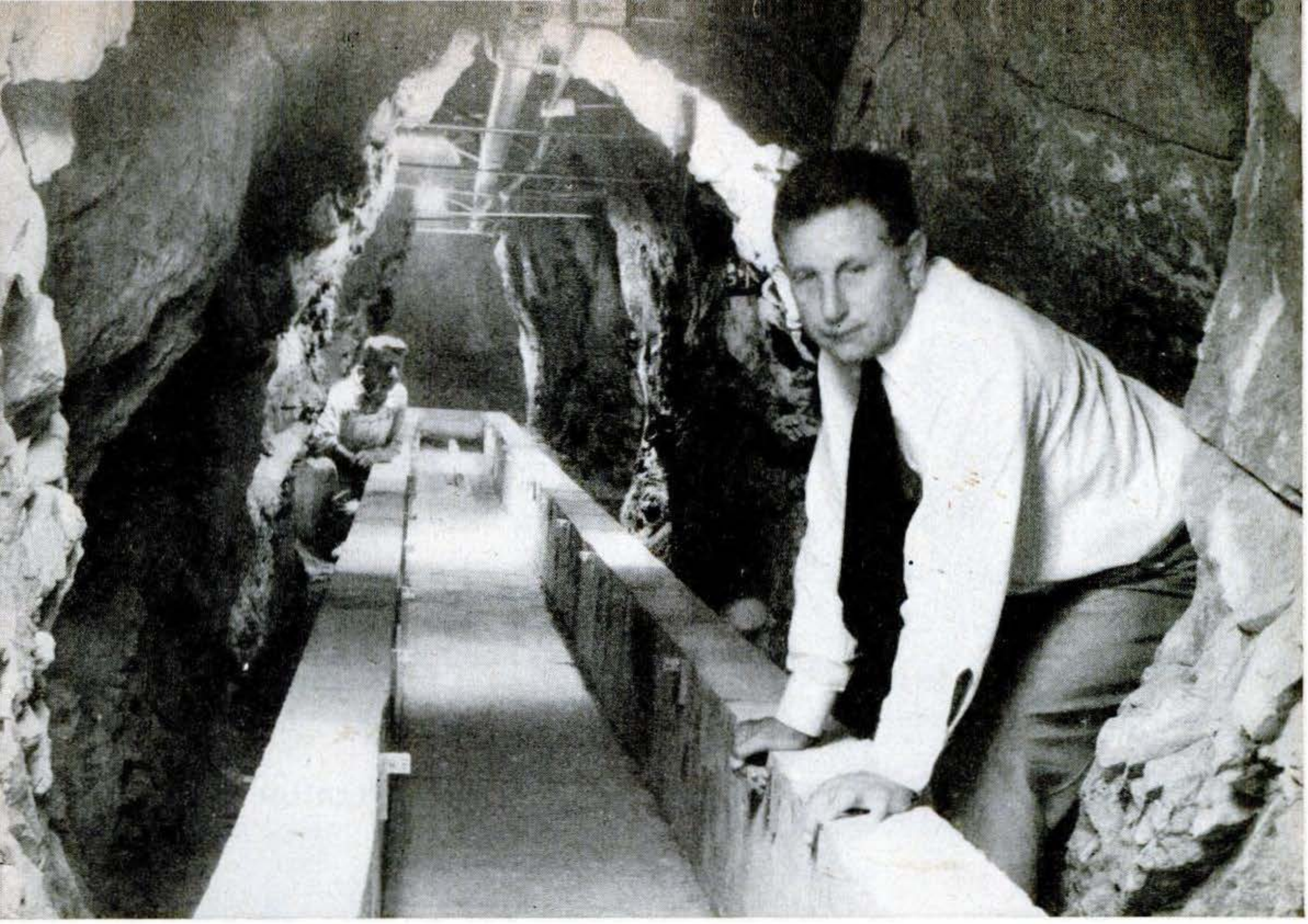


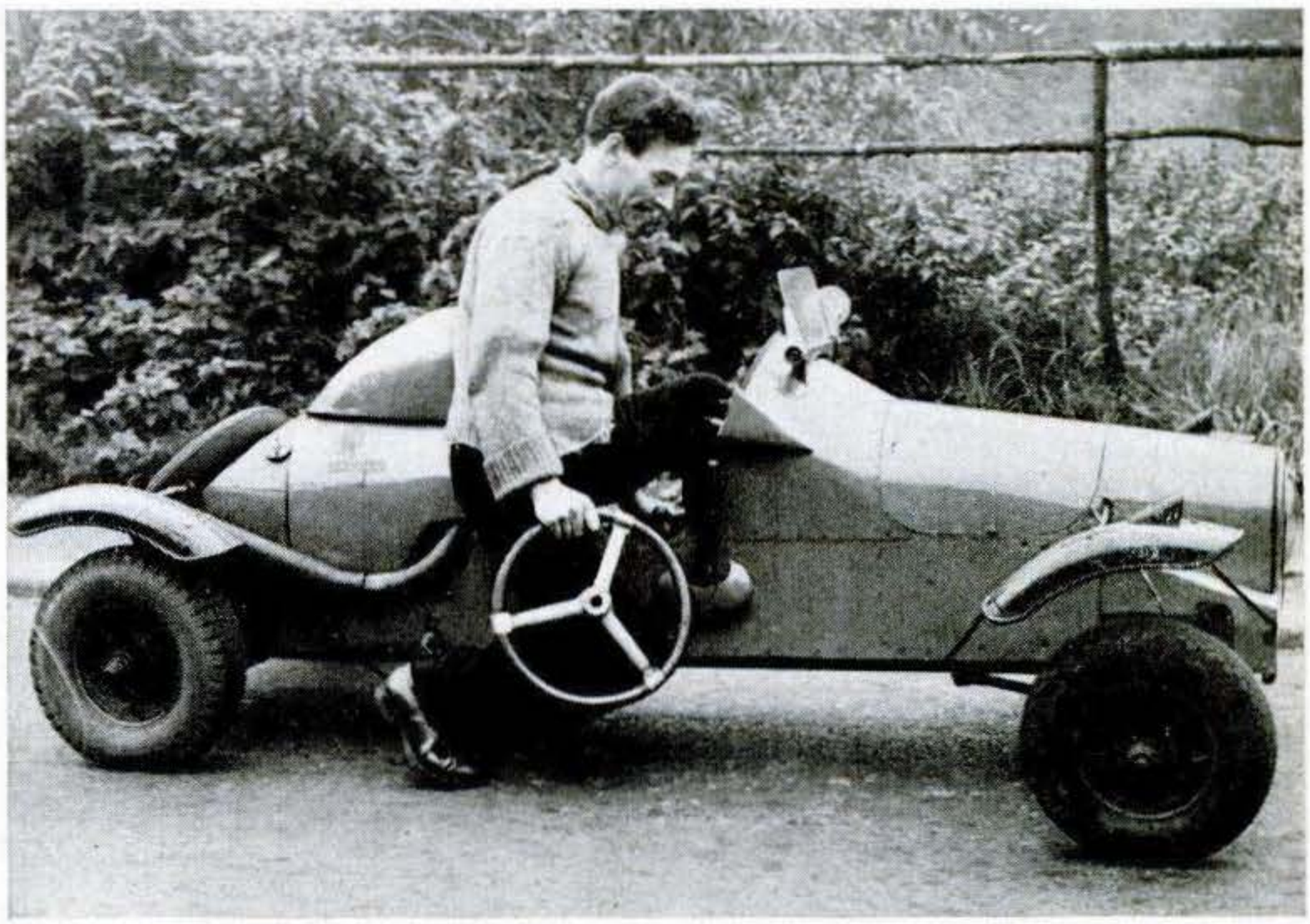
DR. BENIOFF (foreground) inspects 80-ft. concrete trough in which quartz rod will hang. The quake-predicting instruments will be installed at this outer end of tunnel.

and around the earth, sometimes completing the circuit two or three times. These waves constitute an earthquake. Only near the starting point, however, are they violent.

Their size and extent are almost beyond human comprehension. One report from the Tehachapi disaster said the release of energy there was equivalent to that of 100,000 atom bombs. END

Britisher Builds Car That's a Tight Little Fit—But It's Cheap

FRED MCARDELL of the movie *Tight Little Island* has built himself a car so tight that he must remove the steering wheel when he climbs in or out. He made every part of the car, except the 21.35-cubic-inch motorcycle engine and the tires, for less than $10. Fred claims that his machine will cruise at 50 miles an hour, do 65 miles to the gallon. Note outboard horn and nifty front fenders with headlights.



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GIs Build Own Traffic Lights

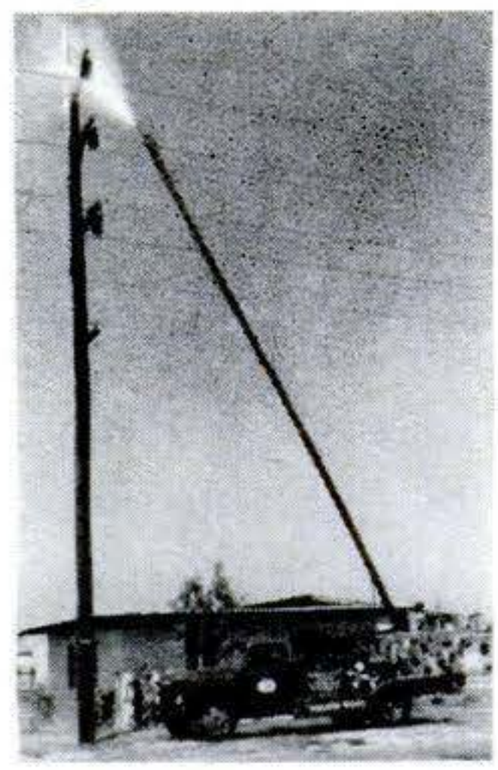
KOREAN roads not equipped for handling heavy military traffic gave GIs a rough time until they dreamed up this three-way signal light. Put together of tin cans and Christmas tree bulbs, it is the brain child of Cpl. Irving J. Laborovitch, Minneapolis, and Pfc. John J. Stinglen, Philadelphia. Both are in the Thunderbird Division.

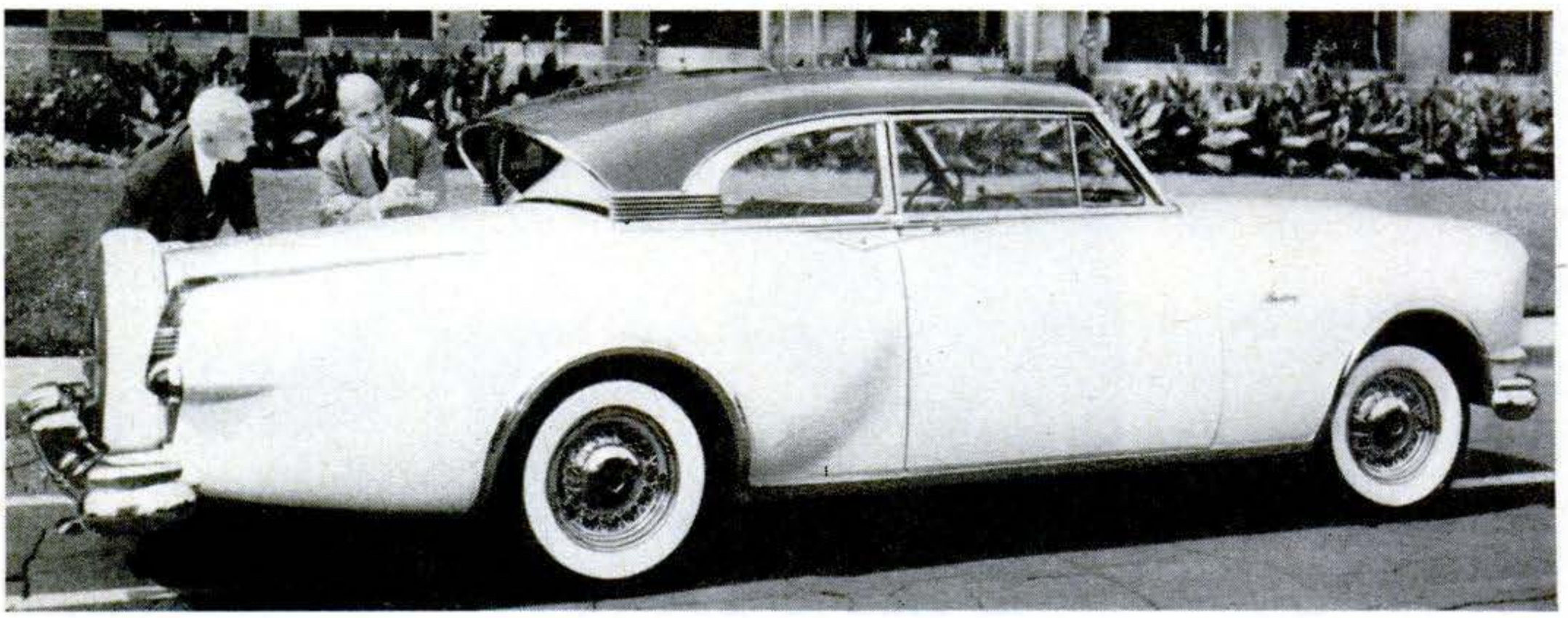
The Sarah Joins the Mae West

SARAH—the RAF's new radio beacon for crash survivors—is worn in a pouch on the Mae West and run by an underarm battery. It can send homing signals for 20 hours, reaching planes at 10,000 feet within a 66-mile range or surface ships six miles away.

Sprayer Scrubs Highline

THIS truck-mounted sprayer cleans transmission-line insulators of salt and smog deposits in Florida communities. The power company says regular baths reduce shorts and help to eliminate television interference. A two-man crew can wash about 60 poles in a day.





Packard's New Experimental Sedan Gets Ranch-Type Roof

MORE comfort for back-seat riders is what Packard had in mind when designing the experimental Balboa (above). The roof forms a canopy at the rear, shading it from the sun. The window, which lowers into the body, has a reverse slope to shed rain and snow. The arrangement adds headroom but eliminates the shelf above the seat. Tail lights are inset in sweeping fenders that meld with the long rear deck.

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Clothes Make the Man...

WOOD-PULP COOK

MEN at a western wood-pulp mill who work around sulfuric acid protect every square inch of skin with the new acidproof suit at left. Hood, coat, boots and gloves have pink markings—the same color used to identify acid pipes—to keep the suit from being used in any other area of the Weyerhaeuser Timber plant, Everett, Wash.

RADIATION HAWKSHAW

NOT A jockey but a radiation detective, the fellow at right will protect New York's Con-Edison disaster crews in an atomic attack. Trained to estimate how much radiation men can take and still stay on the job restoring electric power, he'll detect and classify hot areas. He wears white for quick identification and carries a Geiger counter, pickup probe and dust mask.

JET JOCKEY

A JET pilot who bails out in the outfit at left won't be exposed to supersonic wind blasts or left without an oxygen line because he's lost his helmet. Air ramming into him and building up pressure inside the suit escapes through a slot in his new helmet instead of blowing it off. This pressure release also keeps suit seams from ripping and creates a partial vacuum to clamp the helmet more firmly to his head. Douglas engineers designed the outfit.

JET BUILDER

AN ARMORED breastplate that could stop a bullet protects Lockheed workers from flying metal particles thrown off by high-speed milling and cutting machines. Made of laminated glass cloth and resin, it is ⅛-inch thick, weighs only three pounds.

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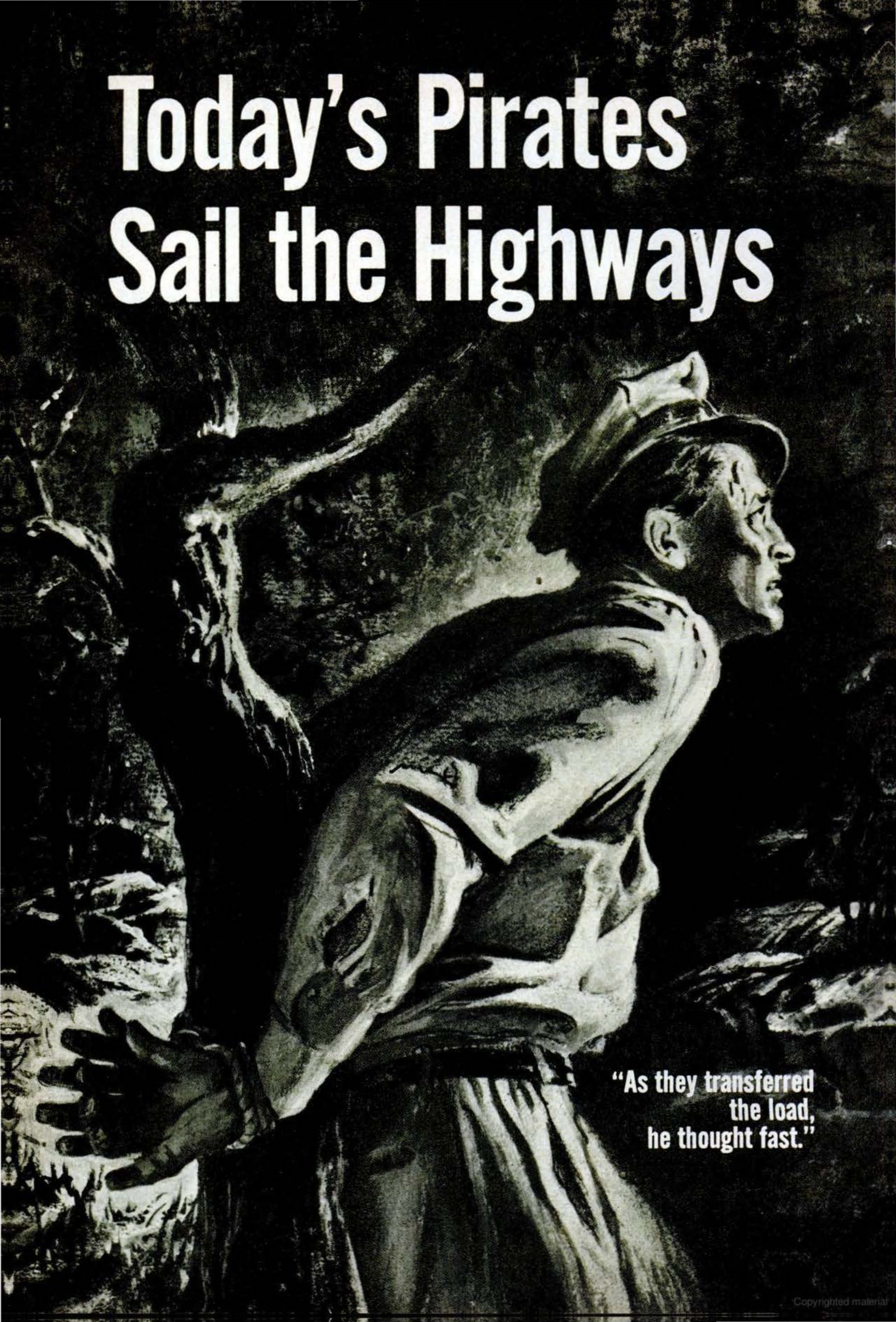
Today's Pirates Sail the Highways



"As they transferred the load, he thought fast."

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These tales of how truck hijackers work suggest also how drivers can fight back.

By Robert E. McCord

THE girl was pretty, and the young truck driver was lonely. He was rolling his big rig through the outskirts of Boston for a night-long run to New York, and the journey seemed certain to be dull. Picking up hitchhikers was firmly forbidden by company rules—but what was the harm in giving a nice girl a lift?

She was headed for Bridgeport, she told the driver as she climbed into his cab.

"That's a good long way," he said, with a chuckle of satisfaction.

By their first coffee stop, in Rhode Island, they were old friends. He had even told her that he was piloting $25,000 worth of cigarettes.

"Excuse me just a minute, Al," she said demurely as they entered the bright restaurant. In the privacy of the ladies' room, she made a crisp, businesslike phone call.

Twenty-five minutes later, back on the highway, their gay conversation was abruptly cut short. A big sedan sizzled past and began to swing in front of them, braking hard. Al was barely able to stop without hitting it.

"What in—" he started to ask the world angrily.

He got a prompt answer. Armed men hopped out of the sedan and ran to both doors of his cab. They ordered him out.

The Girl Did a Good Job

For a moment, he forgot his delightful companion, until he heard one of the holdup men say, as she strolled over to the sedan, "Good job, Sue."

The men bound and gagged him and tied him to a nearby tree. Next morning, shortly after Al was res-

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"A cla
hijac

who supplies advance information on cargoes and routes. All too frequently he works for a trucking firm. His role is vital, for hijackers want loot that is easy to market—cigarettes, cigars, liquor, canned goods, clothing.

That does not stop them from heisting less marketable items when the opportunity comes along, however. One truck driver, for example, parked a load of four tons of lead in a Jersey City lot for the night. The following morning it was gone. A classic blunder was the hijacking of a load of Bibles.

cued, his stolen truck was reported abandoned in New Haven, its $25,000 cargo gone.

This sort of thing, though the technique varies widely, happens every few minutes somewhere in the nation. Highway piracy will cost us around $100,000,000 this year, cargo insurers predict. For months, the FBI has been planning counterattacks, conferring with local trucking firms, shippers, insurance companies, manufacturers of alarm systems and city police in many parts of the U.S.

Ninety-nine percent of all truck hijackings occur in cities, principally New York, Chicago, Philadelphia and Los Angeles.

Hijackers Like Night Work

Most hijackers, unlike their pirate ancestors, prefer to work after dark. They are well organized, planning and carrying out robberies as if they were military operations.

Hijacking gangs—most have under 20 members—are made up of specialists. First, and most important, is the "finger,"

Often a gang will have a "spotter," whose job it is to follow an intended truck victim and warn his fellow robbers if the police show up. Some gangs use walkie-talkies for this thoughtful service.

A smoothly functioning gang must have a "drop-man," who has warehouse space for stolen goods, and a "fence," who will dispose of them. In some cases, both drop-man and fence have been discovered to be businessmen with respectable reputations.

One of the most costly truck cargo robberies in recent months probably involved both an inside man and a spotter. It happened one morning last February, when Fred Blumberg maneuvered a truckload of television and radio tubes into the loading dock of an electrical company's warehouse in downtown New York. Blumberg went into the warehouse office to arrange for unloading.

When he returned to his truck, a smaller, panel-type truck was parked beside it. He barely glanced at it as he stepped into his cab, but at that moment a man emerged from the smaller truck with a

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drawn revolver. He forced Blumberg into the rear of the panel truck, where he was blindfolded and bound.

Blumberg's truck, containing a $400,000 cargo, was immediately driven off. He himself was trundled around New York streets in the back of the panel truck for four hours, then dropped off in an abandoned railroad station on Long Island, where he finally managed to free himself.

Threats Are Usually Enough

Although heisters usually carry guns, hijackings rarely involve shootings. The threat of violence is usually enough. Sometimes a hijacking is made so easy, through carelessness or inadequate protection, that even threats are not necessary.

For instance, a huge red cargo trailer containing 695 cases of liquor and 178 cases of playing cards was left parked beside the road near Harrisburg, Pa., while its driver unhooked the tractor and drove off to York to have repairs made. Hijackers, who presumably had been following this particular load, rounded up another tractor, connected the air hose and couplings to the parked trailer and made off with loot valued at $53,000.

Sometimes a quick-witted driver manages to turn the tables on his captors.

One cargo thus saved consisted of cigarettes, being trucked from Richmond to Norfolk. The driver was forced to a stop along a lonely stretch of highway and held at gunpoint while the robbers drove his truck down a side road, put the vehicle out of commission, and tied him to a tree within shouting distance of the highway—with the blithe assurance that he wouldn't have to wait very long to be rescued.

As they transferred the load to another truck, he thought fast.

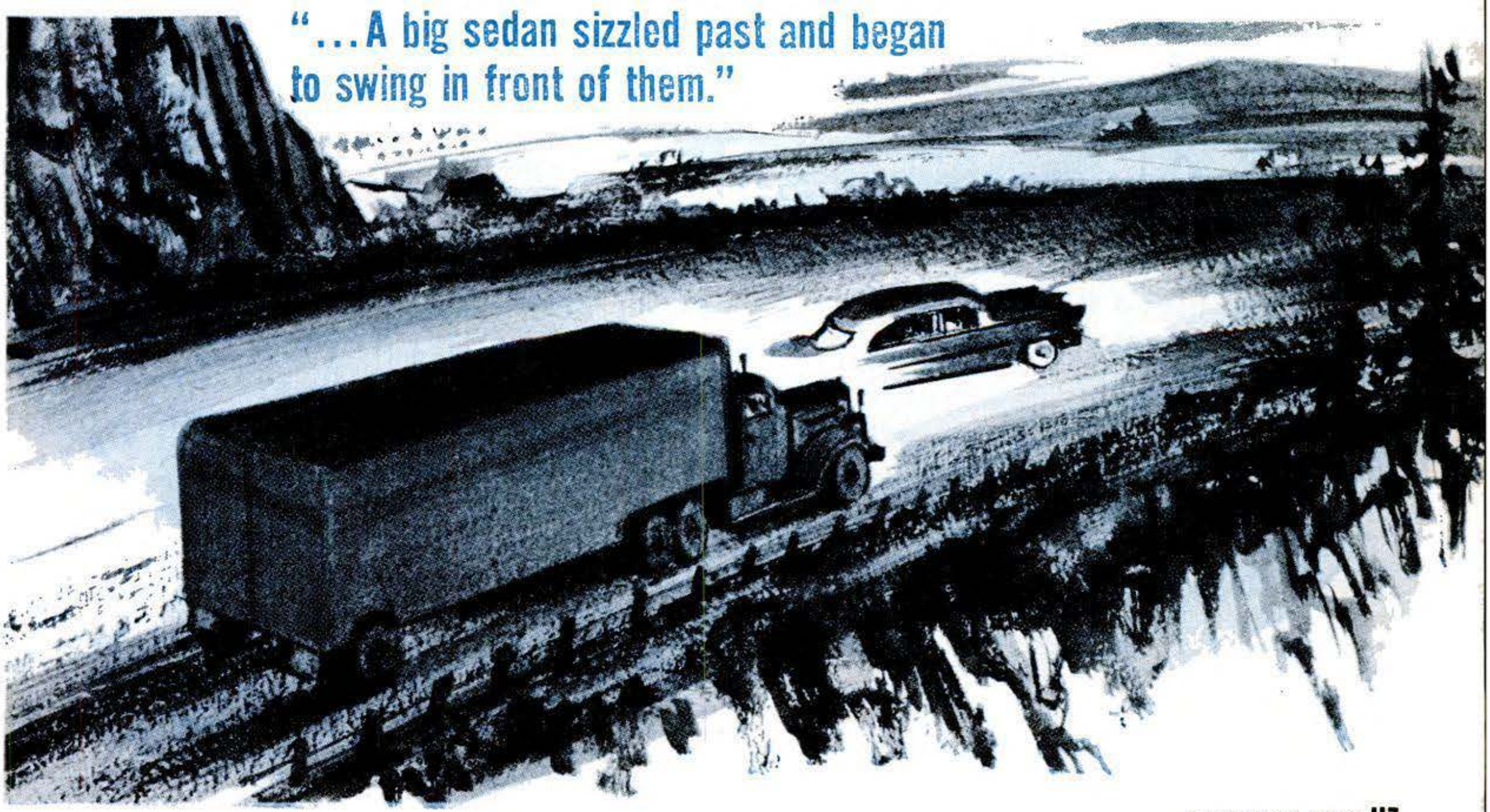
"I haven't got any money to get back to Richmond," he pleaded, as they were about to leave.

At that, the gang leader, a remarkably magnanimous type, opened his wallet, took out a new $10 bill, and slipped it into the driver's shirt pocket.

"Don't worry, buddy," he said.

In a fairly short time, the driver was rescued, but he was shrewd enough not to touch the money that had been given him. Once back in Richmond, he telephoned the FBI. They were able to get clear fingerprints from the bill that led to capture of the gang and recovery of the stolen cargo.

[*Continued on page 262*]



"...A big sedan sizzled past and began to swing in front of them."

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Even Engine Is Aluminum in This French Sedan

THE six-passenger Dyna Panhard is about the size of a Hudson Jet but weighs barely more than half as much: 1,430 pounds to the Jet's 2,700. And although its engine develops only 42 horsepower (to the Jet's 104), it knocks off a top speed of 80 miles per hour.

Secret of the new French car's low weight and high performance is that it's mostly made of aluminum. Aluminum alloys are used for the chassis, body, transmission case—and even the engine. Body and chassis are pressings spot-welded into one unit, streamlined on the basis of wind-tunnel tests.

A flat, two-cylinder, air-cooled engine, mounted well forward of the axle, drives the front wheels. It gets 33 miles to the gallon.

Full-Size Opera Glasses Fold Flat to Fit in Your Pocket

HINGED front lenses let these 3½-power opera glasses (left) fold to the size of a cigarette case for carrying. They're made in Japan and imported by Compass Instrument & Optical Co., New York.

▶▶▶A new quick-drying material that can be sprayed on metal like paint makes the surface withstand temperatures up to 5,000° F. It was developed by B. F. Goodrich for the armed forces for use in rockets, guided missiles. Another version protects metal from acids, alcohol and weathering.

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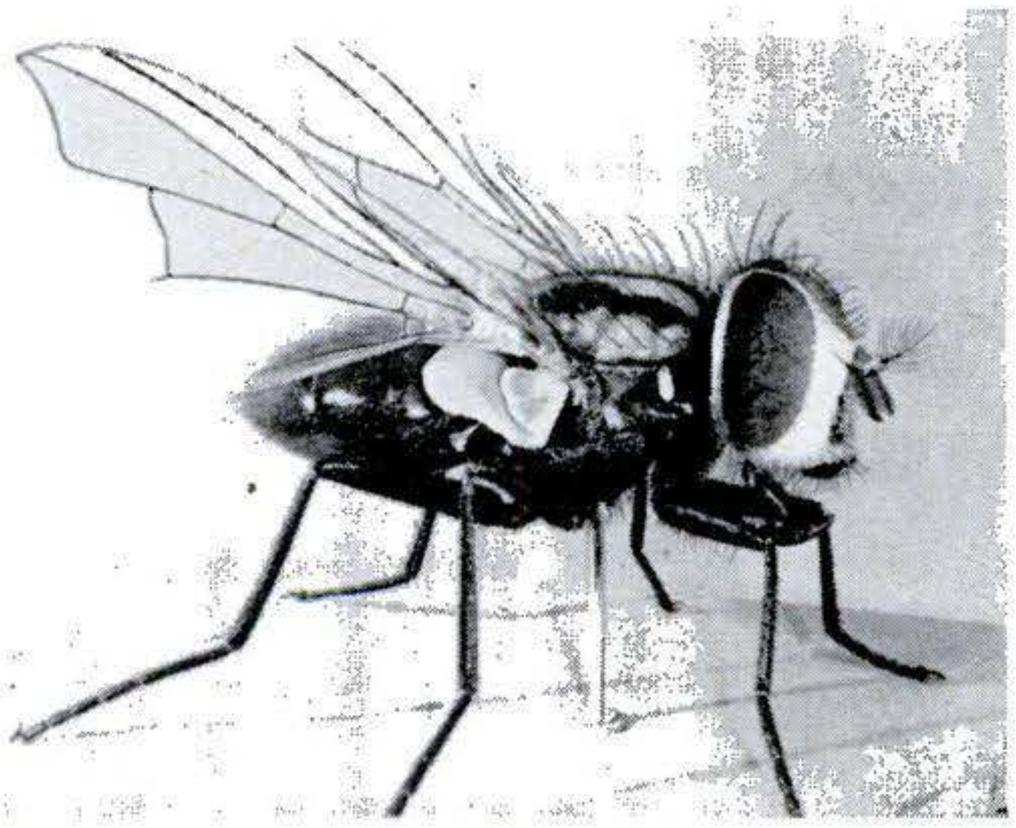
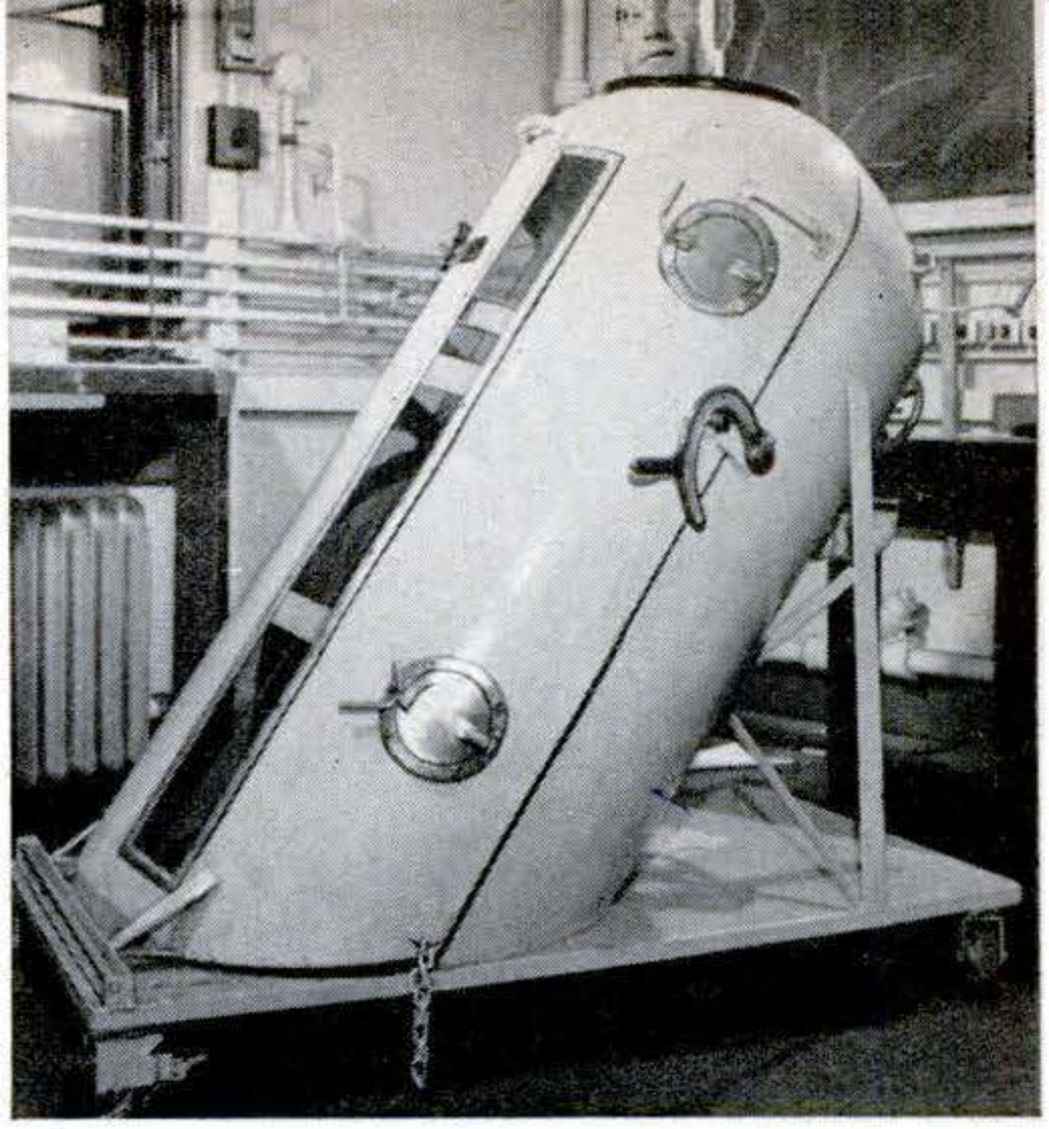
Vibrator Detects Cracked Rails

THIS track walker is using a new British device, the Audigage, to detect flaws in rails. His headphones pick up the echoes from high-frequency impulses bounced against the rail by a vibrator. A sound rail gives off a high whine; a cracked one, a sudden drop in pitch. The outfit runs on a battery carried on the operator's back.



Built to Scale: 262,144-to-1

THIS 29-inch plastic fly, made as a museum model, is 262,144 times the size of a real one. Created by the C-D Olsen Studios of West Nyack, N.Y., it is authentic in every detail from the more than 14,000 spines and hairs which adorn its body to lustrous wings .015-in. thick.



New Lung Lets Patient Sit Up

A POLIO victim needn't lie on his back in this new respirator, being tested at the Harvard School of Public Health. It was designed to give a patient a more normal view of the world than he gets when confined to other "iron lungs." He sits on a comfortable chair that can be raised, lowered and otherwise adjusted.

Two-Wheel Skates Cut Noise

CENTERED wheels give these new roller skates the feel and maneuverability of ice skates. The artificial-rubber wheels, rounded instead of flat, are said to be less noisy, speedier, better for pivots and sudden stops. The two-wheelers are made by the Rocket Skate Co., Burbank, Calif.

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How You'll Get TV Colorcasts

Color broadcasting has been started—here are answers to your questions about it.

By Devon Francis

COLOR television broadcasts—colorcasts—have been started. They are on the air a few hours a week.

For the moment they are confined to the New York area. Before the turn of the year some programs will be networked to Chicago. On January 1, Pasadena's Tournament of Roses and the Rose Bowl football game will be networked in color.

Dozens of TV stations throughout the country are getting ready to carry network shows in color. More will follow.

The owners of 24,000,000 TV sets in black-and-white are asking, "When can I get color TV?"

The answer to that question, and to others on the coming boom in colorcasts, follow:

When can I get a color set?

Next year, if you're lucky. Manufacturers probably will make 50,000 sets by next fall. After that, production ought to climb rapidly.

What will it cost me?

From $800 to $1,000 at the start, according to RCA, sponsor of compatible color TV. Production will drop the price. Color sets probably always will cost half again as much as black-and-white sets.

What do you mean by compatible?

That colorcasts can be received as black-and-white on your present set.

Can I change my present set to receive color?

Yes. Estimates on conversion costs by the manufacturers themselves run from 30 to 90 percent of the price of a new color set.

When will my local stations begin colorcasting?

More than 55 TV stations already have signed up for network color. Dozens more will follow in the next few months. But few will put their own color programs on the air in the first year—color cameras and related equipment will be scarce for a while.

When will the rest of the country get color TV?

That will depend on how fast the stations can obtain the equipment. Any station now telecasting in black-and-white can modify its equipment to accept colorcasts from the networks. It will also depend on how fast the telephone company's equipment—necessary to networking TV—

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is adjusted to carry color. The Southwest, Northwest and mid-South, exclusive of coastal areas, have few TV stations as yet.

How good, actually, is the color?

It's fine. A public survey made by RCA-NBC during one phase of the development work showed that most viewers were delighted with it. To the question, "How do you feel about the over-all quality of the color television pictures you have seen?" 98 percent responded that it was excellent, very good or good. About the same number said the detail was clear. Three-fourths of the viewers thought the colors were about right, one-fourth that they were too vivid.

The handful of people who didn't like color TV said the pictures were fuzzy or that the colors weren't true.

How will I operate a color set?

On present models, the same as you do your black-and-white set. There's one more control. Turn it far left, and all color is drained from the picture. Turn it far right, and the colors are "saturated," with reds predominating. In between, you adjust the set for as much color as you want. Eyes differ.

How big will the picture be?

To start, 14 inches. Bigger tubes are planned.

What will be the size of the cabinet?

About that of your present one except that it will be a few inches deeper to accommodate a longer kinescope.

Will I need a different antenna?

No, but your antenna installation should be good.

What will it cost me to replace a bad color tube?

Until they begin manufacturing tubes in the millions, probably upward of $250.

Will the repairman charge me more to fix my color set?

Probably, it's more complicated.

Will color eventually obsolete my present set?

Only if you insist on having color. The experts say there will always be telecasts in black-and-white. What would color add to the Friday-night fights and dozens of other programs devoid of color?

How good is black-and-white reception from a colorcast?

Excellent. Most viewers say it's better than regular black-and-white reception. Color pictures have a better "half-tone rendition" than black-and-white. You can detect little spots embedded in the scanning lines if you get too close, though. Those are created by the color sub-carrier in the colorcast. Except for them, your present set will "ignore" the color signals.

What makes the color in color TV?

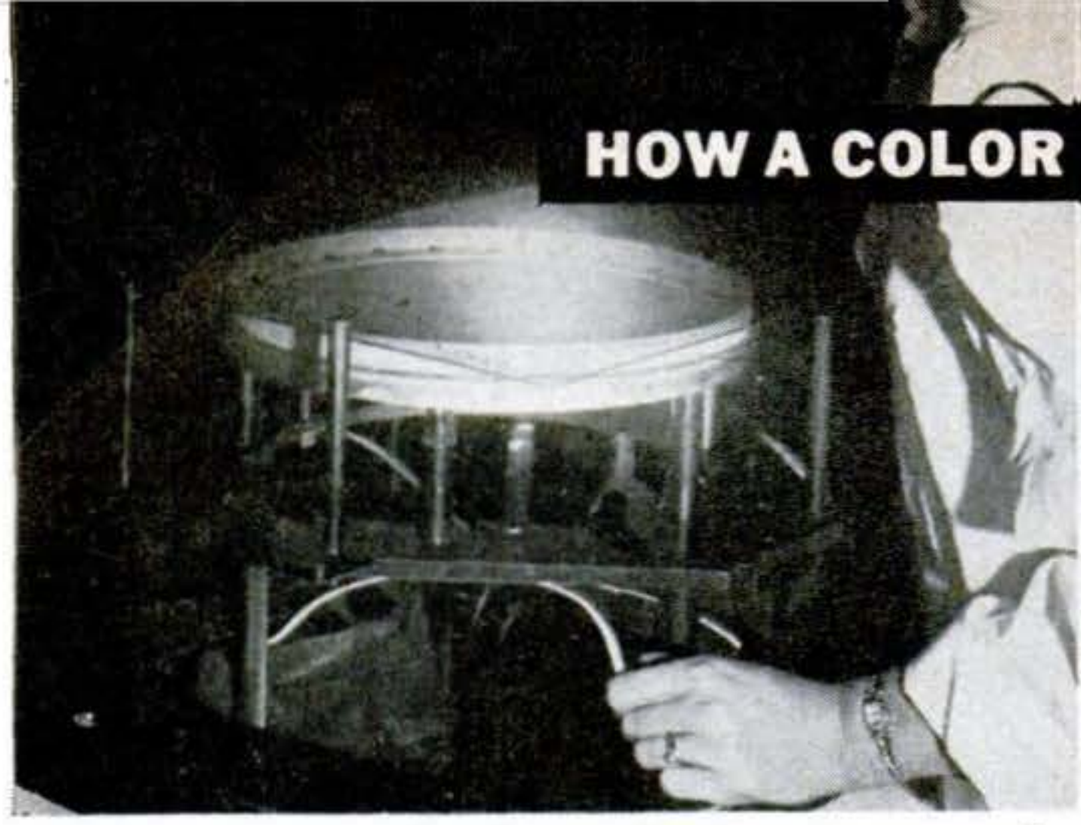
TV colorcasts still depend on a standard black-and-white signal. But the color camera separates what it "sees" into three color images. They ride on an additional signal, or wave —the sub-carrier referred to above.

This is sandwiched in between the frequencies assigned to the TV black-and-white picture and the sound frequency. Actually, the color signal sort of rides piggyback on the black-and-white frequency. When the signals reach your color set, having the same number of scanning lines (525) as your present set, they will be converted into color indications on

[Continued on page 266]

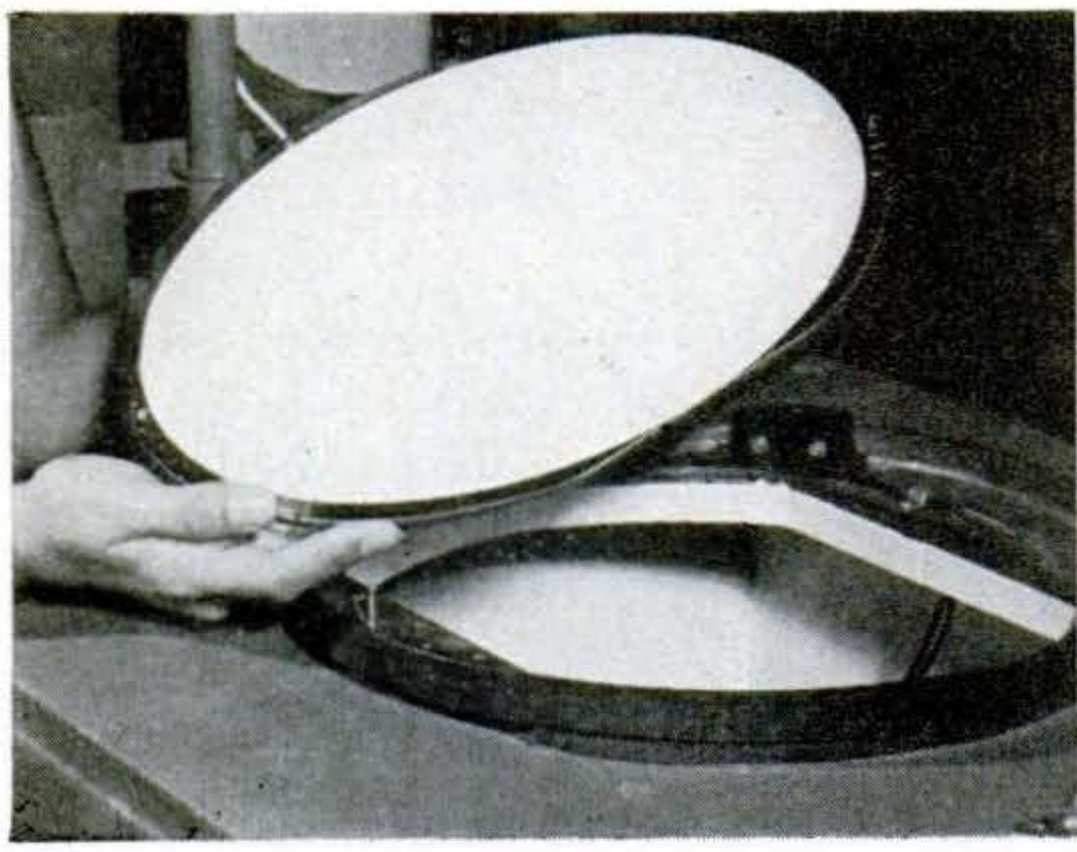
Please turn the page to see how color TV tubes are made.

HOW A COLOR TV TUBE IS MADE

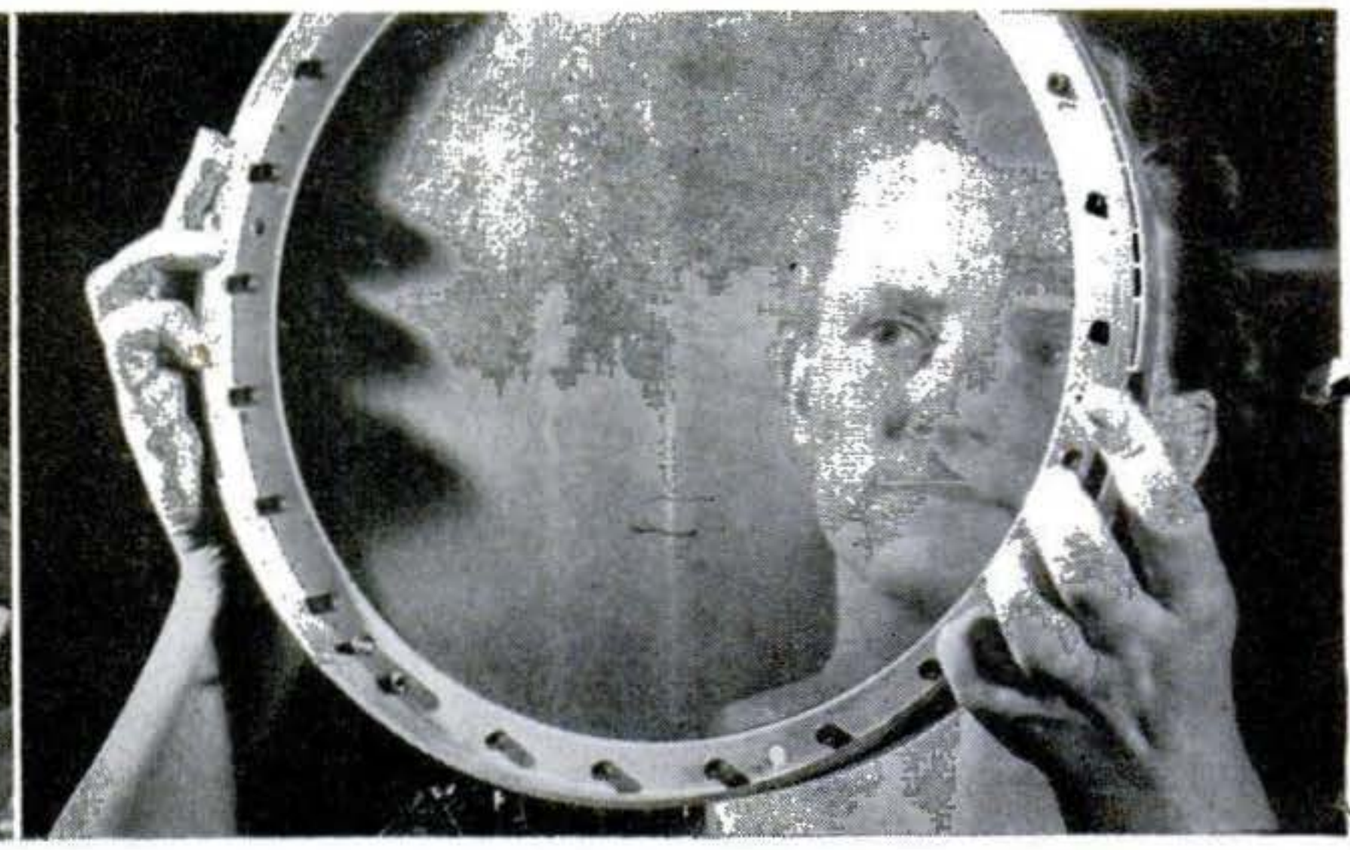


1 PHOSPHORING the face of a developmental color TV tube for a home receiver starts in darkroom. Design of shadow mask—through which electron guns shoot at colored phosphors to produce picture—is photographed on sensitized glass.

2 SHEET OF GELATIN next is laid on negative plate. Exposed to ultraviolet light, it hardens except where 200,000 tiny dots on negative obstruct the light. Soft gelatin behind the dots is dissolved out with water, leaving a stencil for phosphoring the tube face.



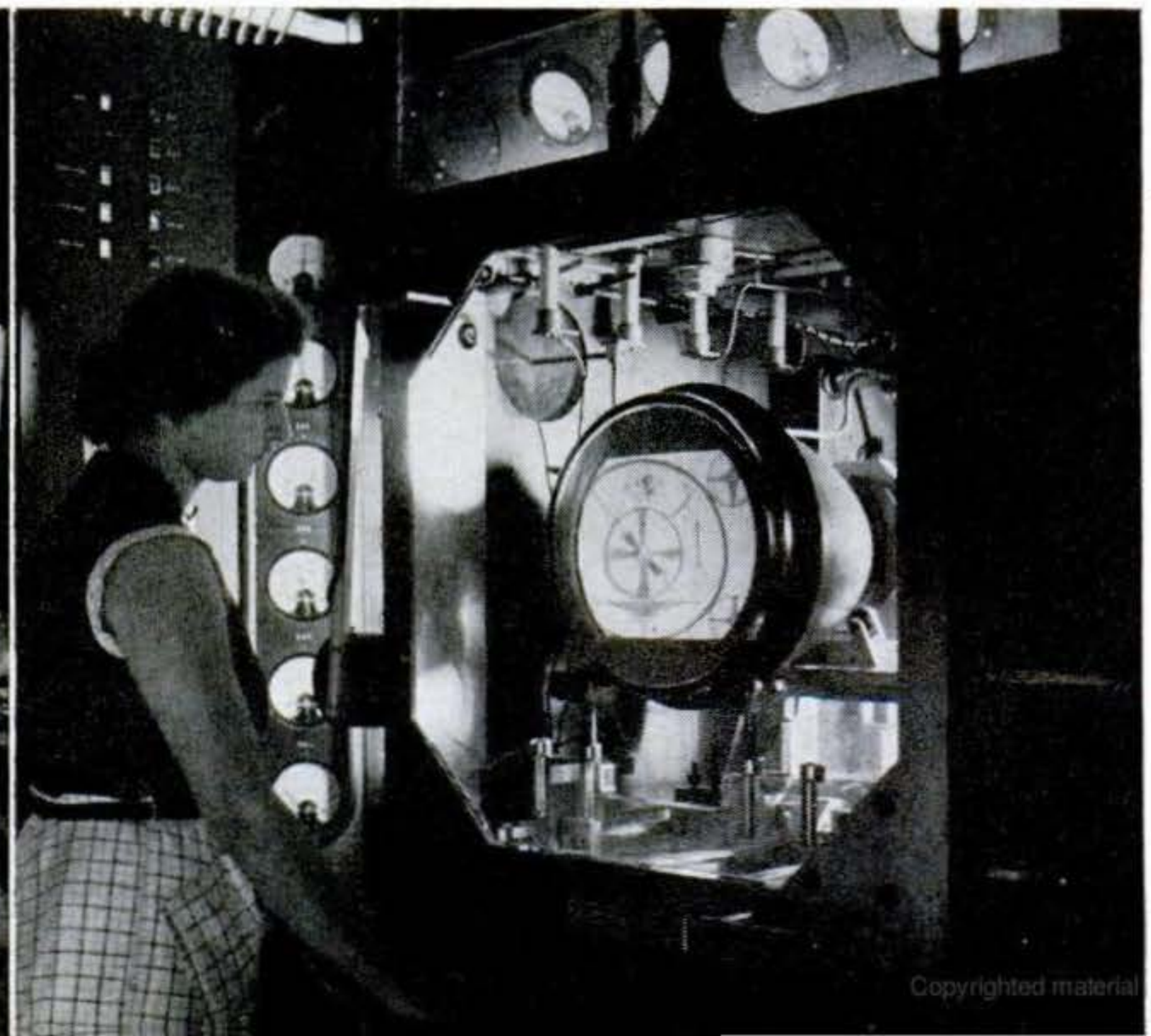
5 DRIED, PHOSPHOR-COATED tube face is put over light source for study under microscope for any flaws in servings of red, green and blue phosphors. Colors are due to addition of silver or copper activators to phosphors.



6 ASSEMBLY OPERATION is next. RCA operator holds shadow mask. Unlike one-piece black-and-white tubes, color tubes have a separate conical body and tube face. Present costly handwork will be mechanized later.

9 FLANGES on face plate and tube body are welded electrically, then examined under microscope. Electron gun has been inserted in neck. Filled with helium, tubes are tested with electronic leak detector.

10 PUMPED FREE OF AIR, tubes are sealed and tested for color fidelity and fineness of picture detail. Barium, which has an affinity for gases, has been put in necks to make vacuum near-perfect.



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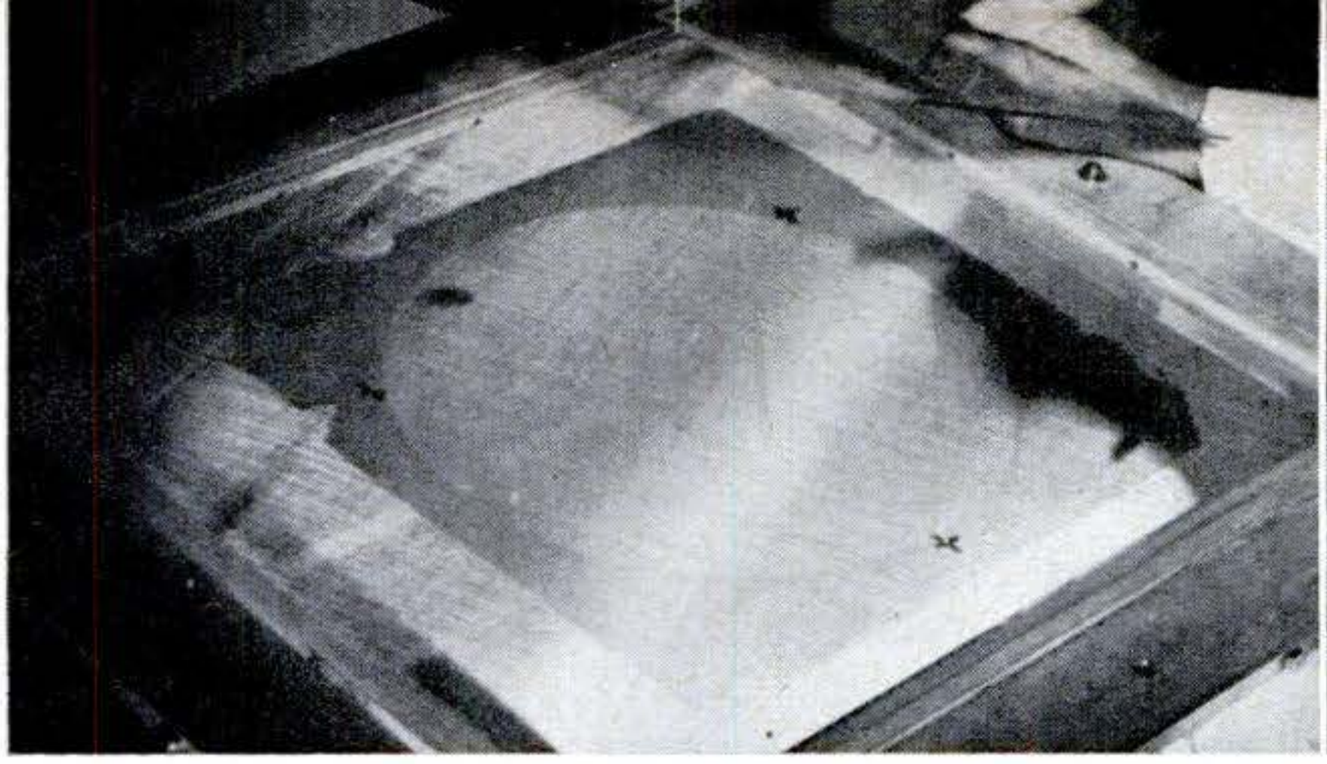
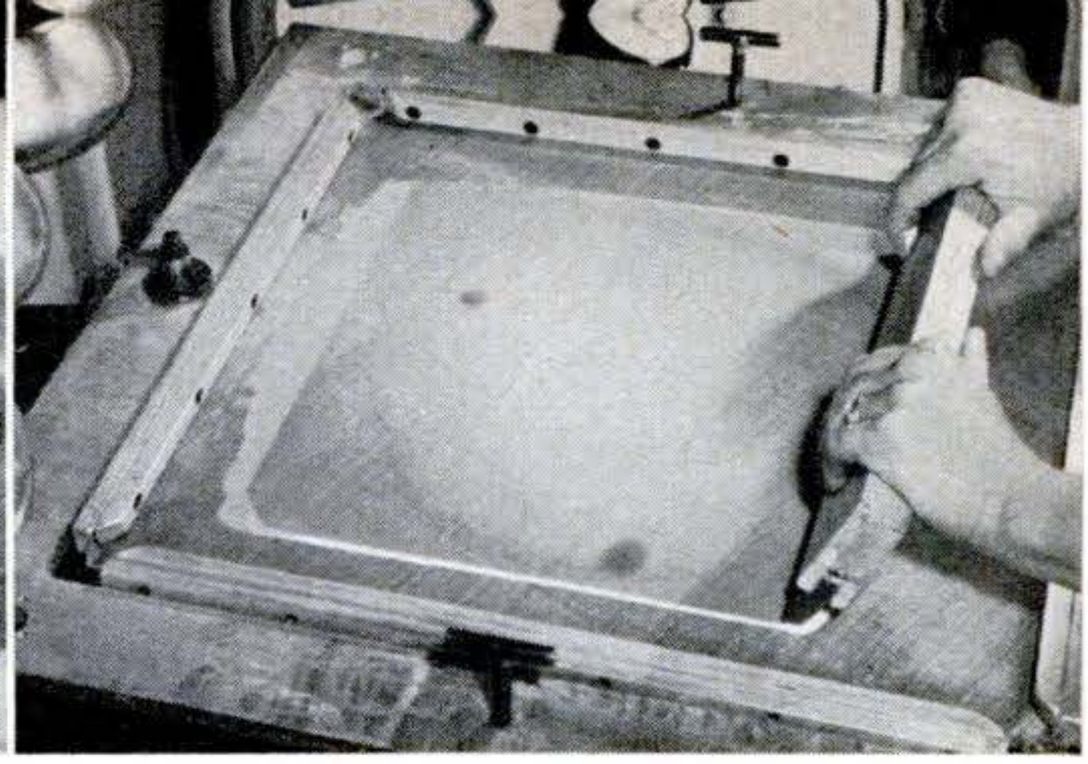
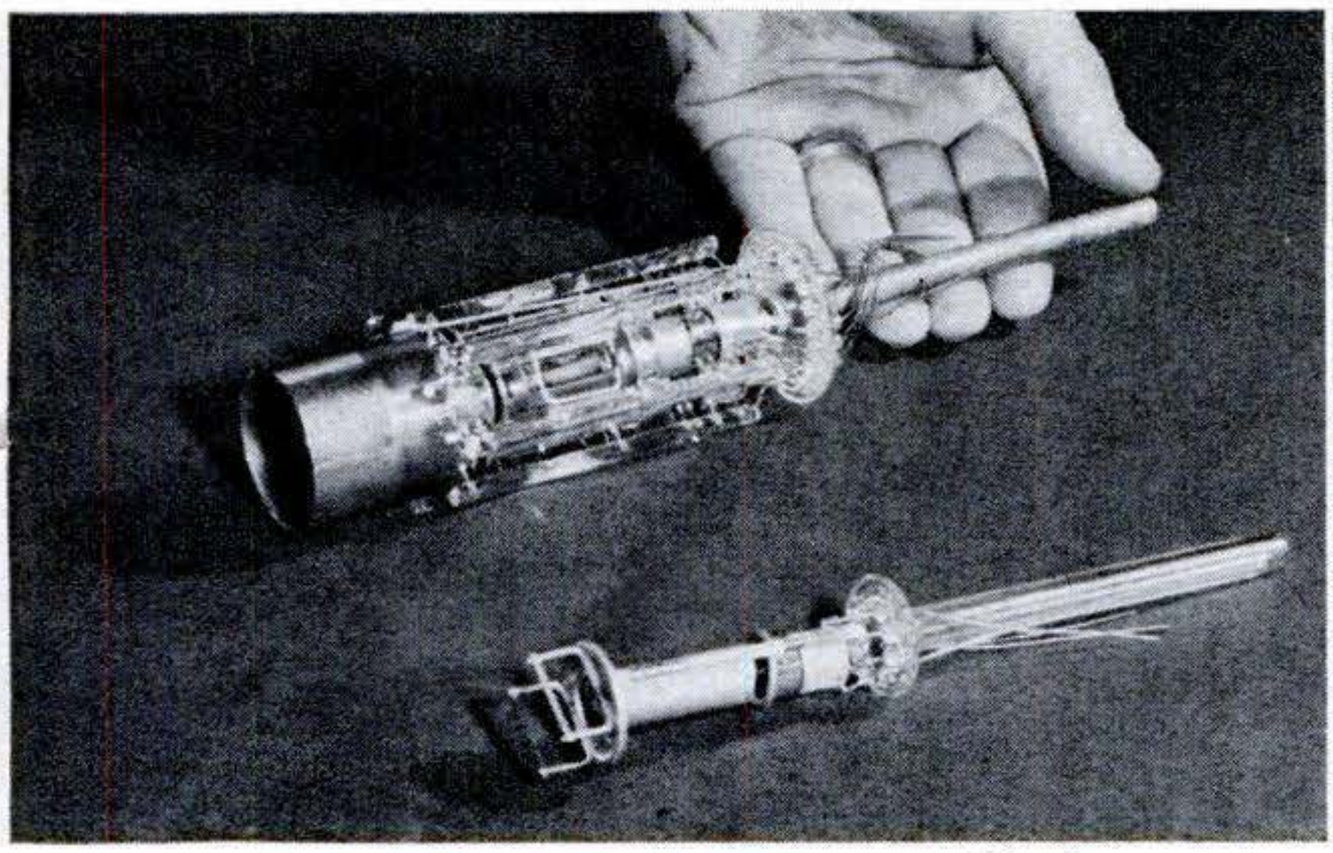


3 REMOVED FROM PHOTO PLATE, stencil is laid on wire supporting screen in frame. Shadow mask itself cannot be used as stencil because phosphors must be spaced for "angle shots" from electron guns. Photo process assures such spacing.



4 GREEN PHOSPHOR PASTE (it looks white) is poured on stencil, forced through holes with squeegee. This prints first third of series of 600,000 phosphor dots on tube face. Stencil is moved 1/1,000 inch to print red phosphors and again for blue ones.



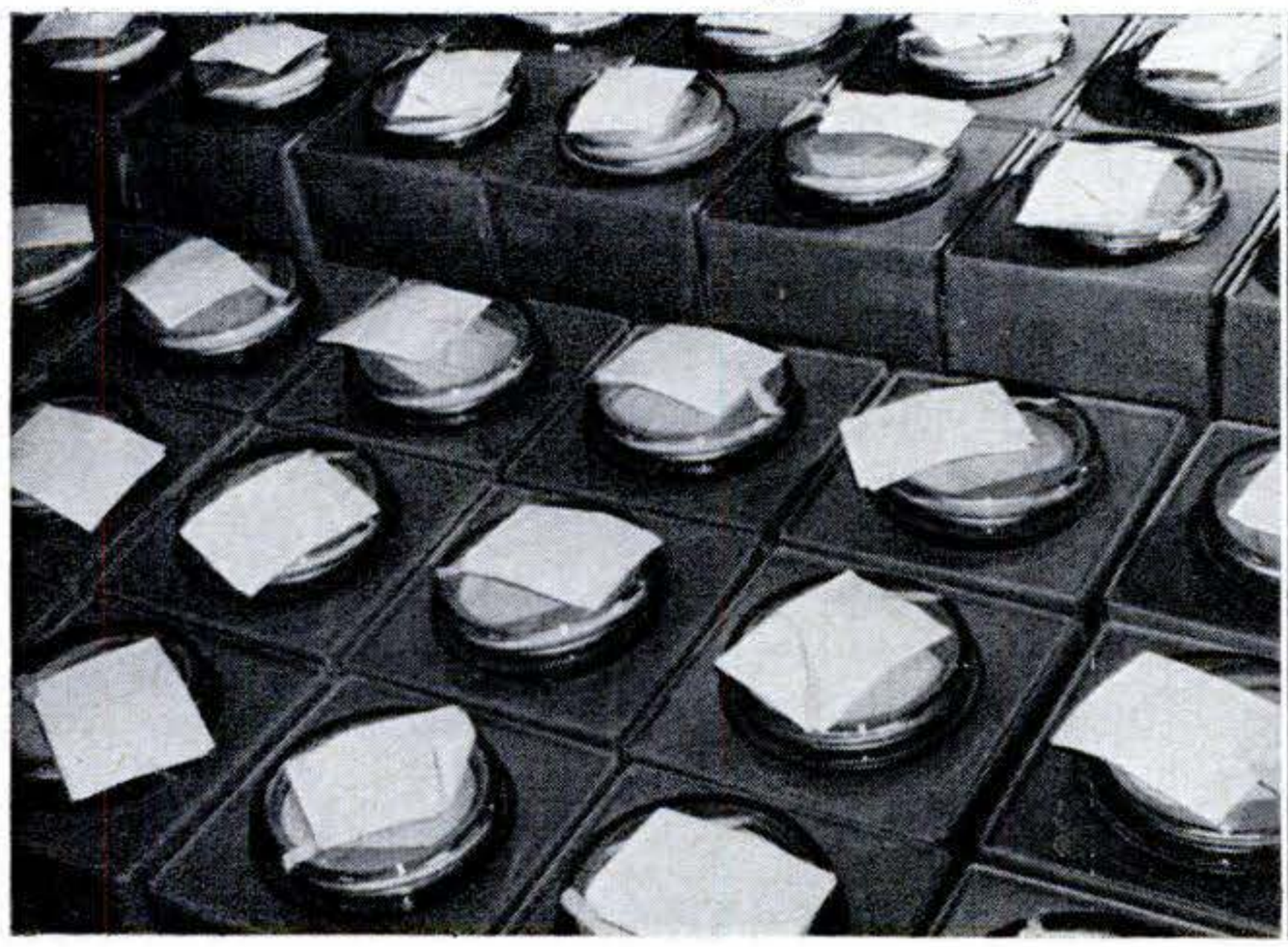
7 ELECTRON COLOR GUN—actually three guns in one—is bigger than that for black-and-white TV, in foreground. RCA has demonstrated experimental tubes bigger than present developmental types.

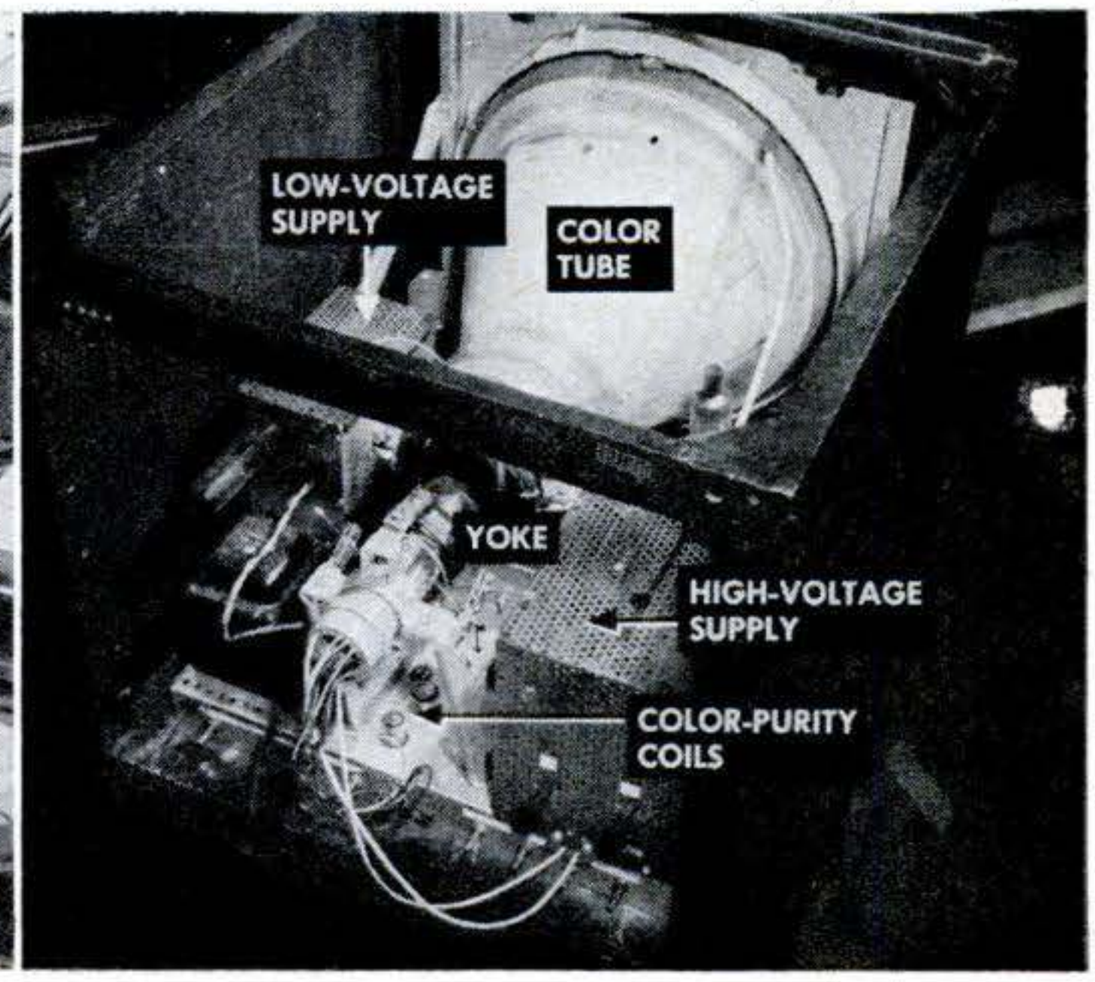
8 PARTS GO TOGETHER on flanged tube body. Shadow mask is first. Then come phosphored plate, a mask for outside of tube face and a glass face plate. Inside of tube body has been painted with graphite.

11 TUBES are readied for shipment. Each carries worksheet showing what has happened to it in manufacture. Number of "spoils"—unacceptable tubes—is being reduced as art of making them is perfected.

12 BACK of your color TV set will look somewhat like that of this experimental one. As for the front, it will look like a black-and-white set, until you turn it on.

Photos taken at RCA tube plant, Lancaster, Pa.





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New Sights in the Sky

Missile Sheds Booster Rockets

FOUR twin rockets fall away in trails of smoke after having done their job of boosting this new British guided missile (center in photo above) skyward to speed along on its own at 2,000 miles an hour. By shedding its booster units simultaneously and smoothly, the missile is not thrown off its course toward an enemy plane. Weapons of this type are being built for launching from the ground, ships or planes.

Hunter's Tail Senses Subs

ELECTRONIC gimmicks in the elongated tail of this Lockheed Neptune enable the big Navy plane to detect enemy submarines lurking several hundred feet below the ocean surface. For the kill, it carries depth bombs, rockets, standard guns—and can even strew mines in the sub's path.

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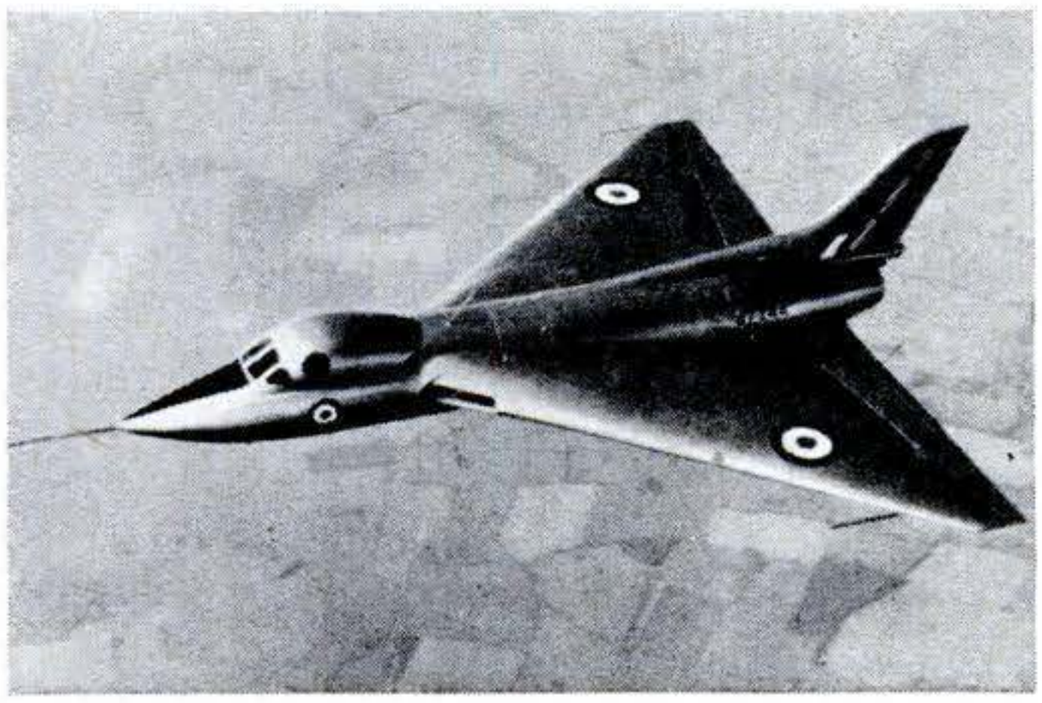
Rocket-Powered Cart Launches New French Fighting Plane

DESIGNED for ground support and as an interceptor, the Baroudeur jet airplane needs no prepared runway for take-off. A bogie truck, powered by six rockets, serves as a catapult to get the plane into the air from any reasonably level ground. The cart is stopped by automatic brakes. Skids underneath the plane, replacing conventional landing gear, enable the craft to land on almost any flat terrain.



Britain Flies Delta Trainer

TO FAMILIARIZE pilots with the flying characteristics of delta-wing airplanes, Britain has developed this dual-control version of its famous Avro 707 research plane. It is powered by a single Rolls-Royce Derwent turbojet engine.

Glider Puts on Brake

A TAIL parachute is released by the pilot to slow down his glider as he prepares for a landing after having set a speed record of 67.5 miles an hour. The new record was established recently at an Oerlinghausen, Germany, sailplane meet.

Jet Bomber Becomes a Tanker to Refuel Other Jets in Mid-Air

THIS is probably the world's first demonstration of a jet refueling a jet in flight. Both are Air Force B-47 bombers. The one at the right, however, has been modified as an aerial tanker. Using the probe-and-drogue method, the tanker releases a flexible hose with a funnel-like drogue at the end. The bomber to be refueled has a spearlike probe in its nose which is slipped into the drogue's coupling mechanism.

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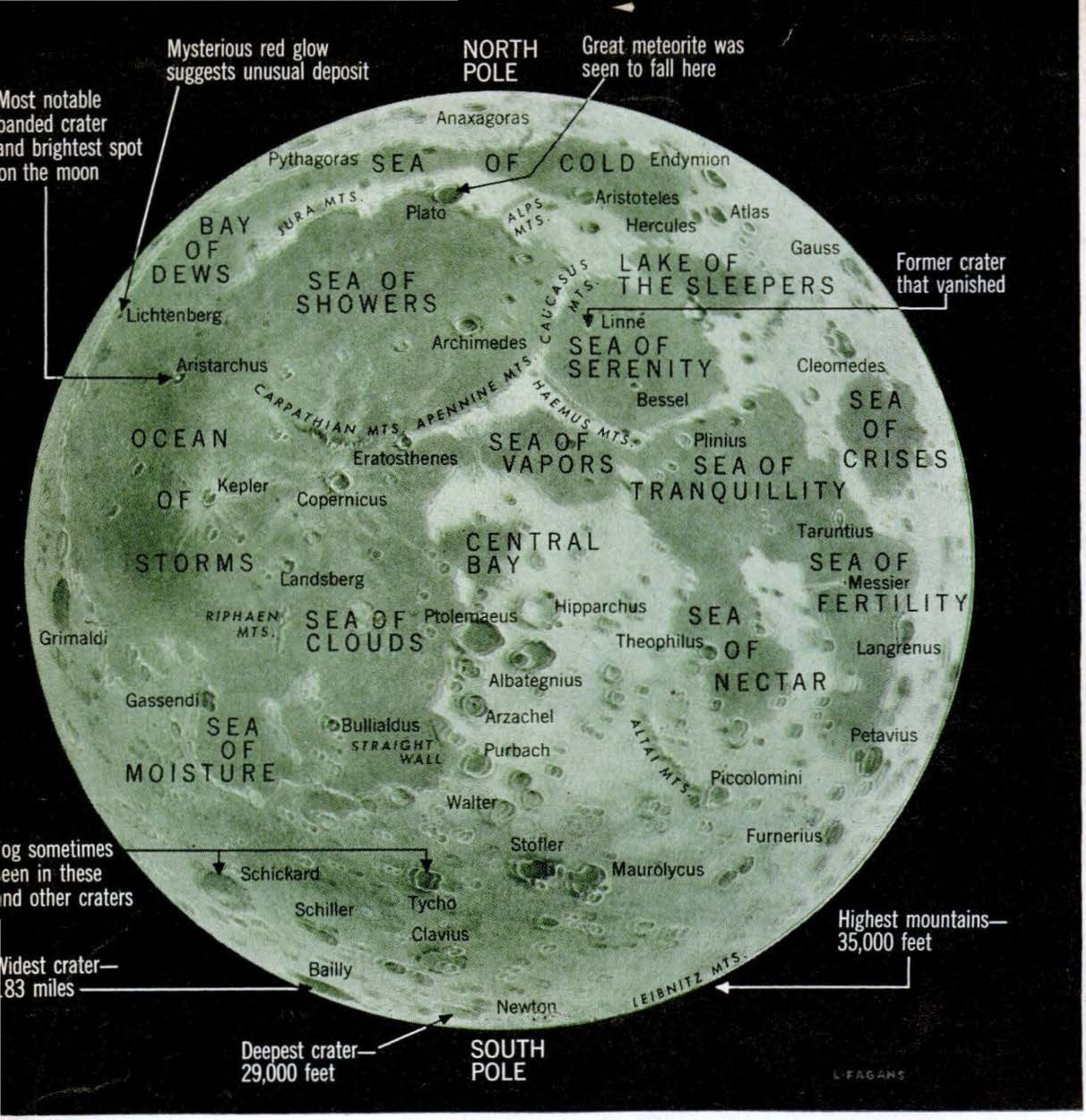

An astronomer's guidebook promises first visitors to Luna a geologist's paradise to explore—and eerie puzzles to solve.

By Alden P. Armagnac

"LEIBNITZ MOUNTAINS. The highest peaks of all, outranking Everest . . . THE SEA OF FERTILITY. One of the larger seas of the Western Hemisphere . . . NEWTON. The deepest of the craters. . . ." Absorbed in the scenic wonders described in your guidebook, you may be unprepared for an outstanding impression of your first visit to the moon.

That's the powder. A blanket of it covers everything, even steep slopes of jagged mountains. Perhaps a foot deep, the glassy stuff yields underfoot like quicksand, and you must learn the knack

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Moon's Mysteries Challenge Spacemen

Moon map (left) shows gaping craters, towering mountains and other points of interest for future explorers and sightseers. Fancifully named "seas," actually dry plains, form great dark areas. So you can recognize them at sight, this "layman's map" shows the moon right side up, just as it looks to the naked eye. (Astronomers' maps show the moon upside down, as it appears through their telescopes.) Here the seas are given their popular English names, translations of the old Latin ones still used by astronomers because they are internationally understood. Picture at right illustrates huge size of 54-inch-diameter image of moon obtainable for photography with top magnification of 200-inch telescope at Mt. Palomar, Calif.

of getting around in it. Static charges make it cling to your space suit and the window of your space helmet. Although fine as face powder, it isn't like dust, since there's virtually no air for it to float in. It's an odd sight to see the powder settle instantly, after you stir it up by wallowing through it or by skiing over it.

What's on the moon—the powder and the rest—will become firsthand experience as soon as rocket ships begin plying outward from earth's man-made space stations. For it stands to reason that our nearest celestial neighbor, whose average distance is only 238,857 miles, will be the first one visited by pioneering spacemen. So declares a young British astronomer, Patrick Moore, secretary of the British Astronomical Association's lunar section, and a leading member of the British Interplanetary Society.

His new book, *A Guide to the Moon*, offers would-be voyagers to Luna, by telescope or spaceship, a veritable travel manual. Places they should visit, and sights they'll see, are described in the light of the most recent scientific findings.

Pointed out, too, are mysteries of the moon that may be fully solved only when

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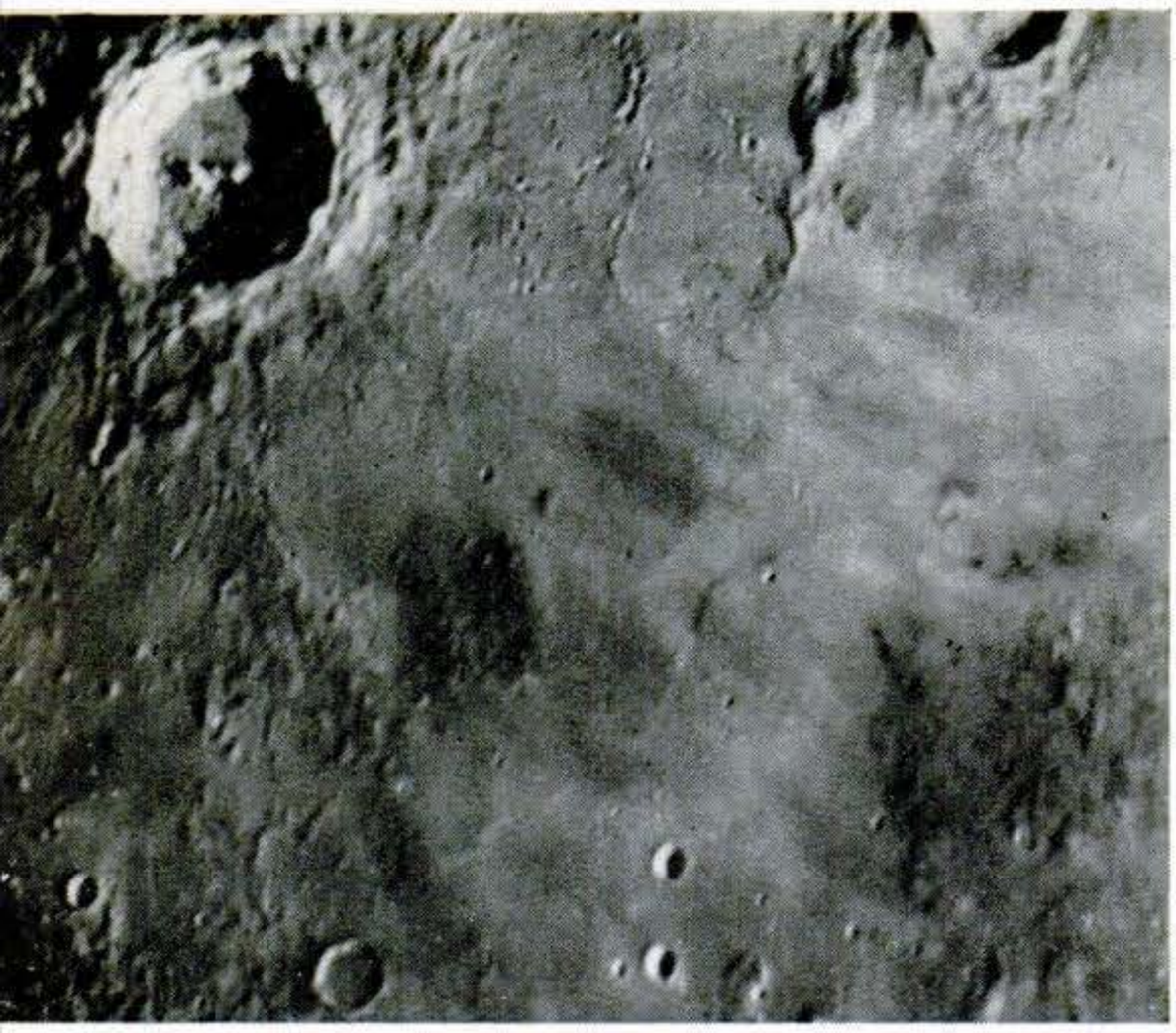

FROM APPROACHING SPACESHIP, 56-mile-wide lunar crater Copernicus and crater Eratosthenes, nearly as large, will look like this. Photo is through 200-inch Palomar telescope. Odd optical illusion turns depressions into elevations, if sunlight is mistaken as coming from left of picture; actually it is from right.

the first rocket ship blasts down to a landing: Is there life on the moon? Has it any atmosphere? Are volcanoes still active? What's on the other side of the moon?

Today these questions remain unanswered, even though the face of the moon that is turned toward us has been mapped better than the interior of Greenland. To an observer at the world's most powerful telescope, the moon appears only 24 miles away. The best photographs of its rugged and pitted surface reveal details only a few yards across. Enjoying such an excellent view of the moon's 2,160-mile-wide disk, astronomers have been able to discern more than 10,000 different surface features upon it.

Upward of 700 of the most prominent ones have received names. The moon's "seas," "oceans," "bays" and "marshes" once were believed to be sheets of water. Today we know there's no water on the moon, and these great dark areas actually are vast plains, but early observers' fanciful names for them have stuck. Craters bear the names of scientists and other notables of past and present, with a few mythological characters thrown in; and some of the moon's mountains are named after famous ranges on earth.

If explorers were ready to start for the moon today, they could take along splendid maps of these surface features. Probably the best, by Dr. H. P. Wilkins, British astronomer, was published in a 100-inch-diameter edition in 1951.

And an expedition might do well to carry the latest maps! For astronomers no longer consider the moon, as they once did, a totally dead and changeless world.

That view was held by the two foremost lunar observers of the nineteenth century, Wilhelm Beer and Dr. Johann Mädler. They completed a lunar map and a book on the moon that were masterpieces of thorough and accurate work. Then they quit. Why observe the moon further?

Thirty years later, however, an astronomer looked in vain for a deep six-mile-wide lunar crater called Linné that had been well known to them. Linné had vanished. Where it had been, there was only a white patch, which marks the spot to this day. The most likely guess of many is that landslides, triggered by a "moonquake," caved in the crater's walls and destroyed it.

WALLS OF LARGE CRATER may vanish from sight of observer as he reaches its center. Sharp curvature of moon, compared to earth's, sinks them below his horizon.

Imagine a moon explorer witnessing such a cataclysm at close range—cliffs falling away, the lunar landscape changing before his eyes. It would be all the more awesome because it would happen in total silence—there cannot be enough

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air on the moon to carry a whisper of sound.

Close observers have since found other mystifying developments on the moon. In 1939, Moore himself observed a dense fog which filled a whole crater with a whitish mist. With no water to form clouds, what could the mist be? Carbon dioxide seems a reasonable guess, Moore declares. And since this gas is given off in volcanic eruptions, mists seen by him and others may indicate that the moon still has active volcanoes.

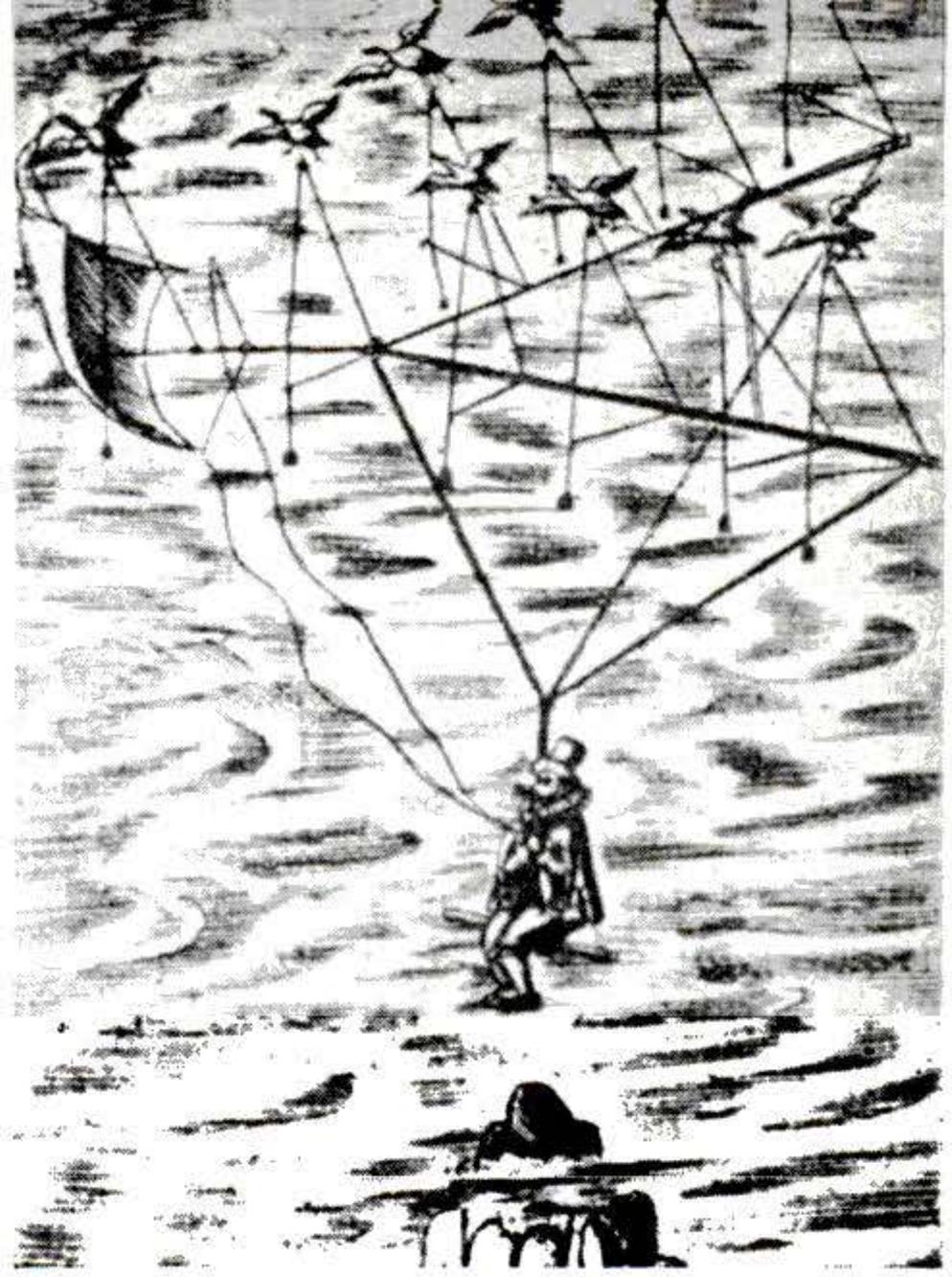
The most remarkable object on the moon, perhaps, is the 29-mile-wide, 5,000-foot-deep crater Aristarchus. Its central peak is the moon's brightest spot, even shining starlike after dark by reflected light from the earth. But still more interesting are dark bands, radiating spokelike from the central peak to the outer walls and up them.

Does Life Exist on the Moon?

Mysteriously these markings wax and wane. They darken progressively outward after sunrise—then shrink and fade toward the end of the weeks-long lunar "day." Through a powerful telescope, the gray-bordered dark streaks resemble the "canals" of Mars. And, likewise, they may be signs of life. Along surface cracks of volcanic origin, Moore suggests, a primitive form of lunar vegetation—lichens or mosses—may develop under the sun's warming rays and revert to dormancy during the bitter-cold period of darkness. Volcanic carbon dioxide gas leaking from the fissures might sustain its precarious existence.

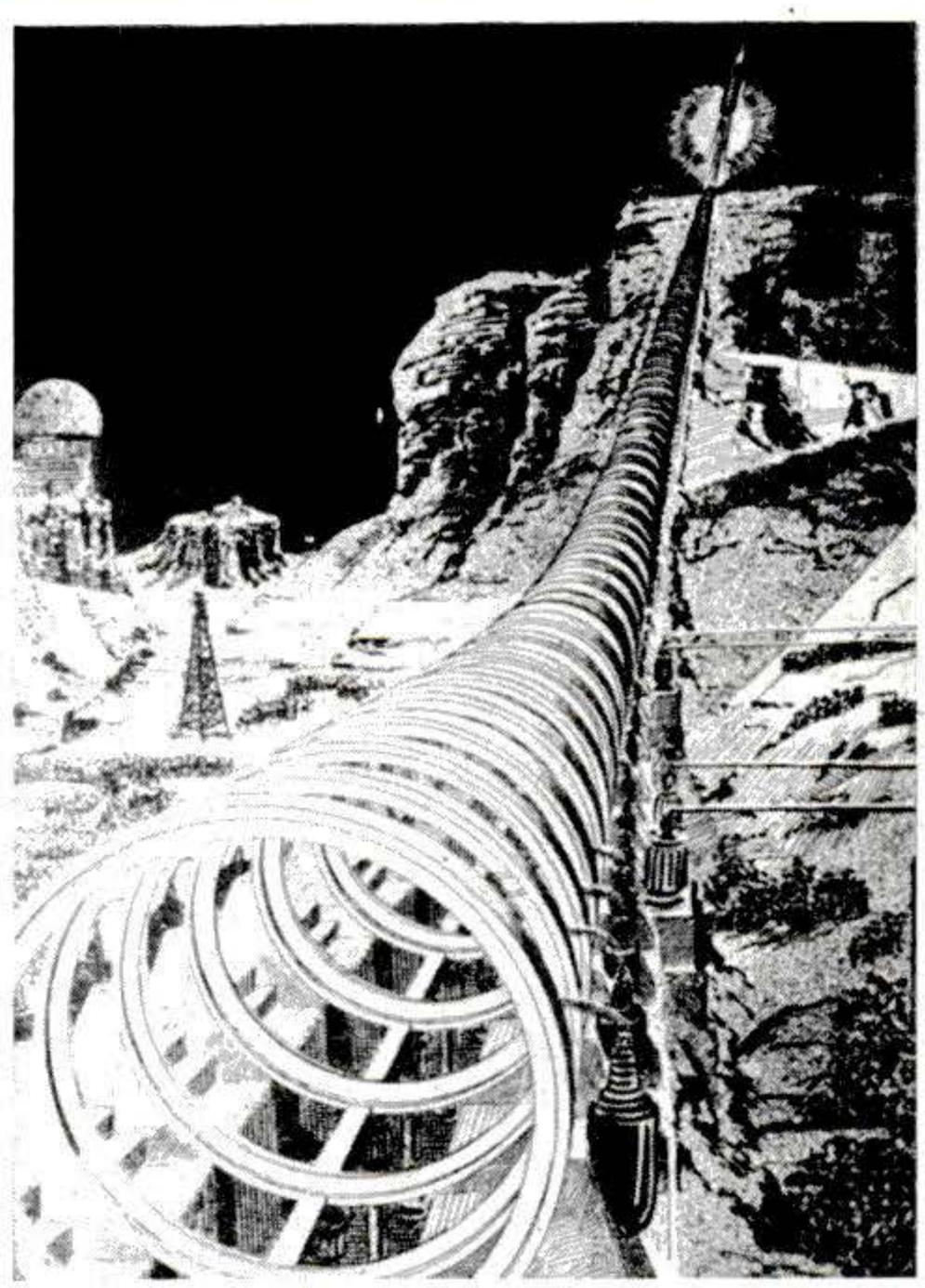
A lunar newspaper would have had sensational news to report in April, 1948. A tiny brilliant flash of orange-yellow light was observed then just within the crater Plato. It must have marked the impact and explosion of a great meteorite—perhaps as big as the one that struck Siberia in 1908 and leveled trees 20 miles away. A few similar observations are on record.

But the most interesting thing about them is their extreme rarity. For if the moon had no atmosphere at all, it has been calculated, the flash of a 10-pound



Moon Voyagers of Fiction Show Centuries' Progress

STORY-TELLERS' ideas of space travel reflect evolution, through the ages, of today's understanding of the problems. Wild swans, hitched by cords and pulleys to the contrivance above, bore a voyager to the moon in a popular tale of 1638. Discovery that space was airless changed styles to ships shot from guns, or from an electromagnetic ramp as below. Rocket spaceships now seem more feasible.



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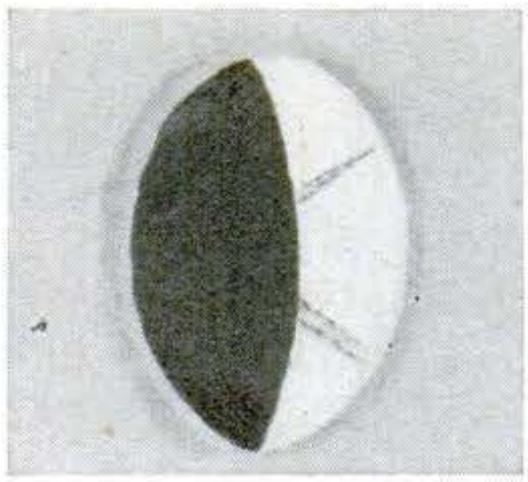
meteorite's impact would be visible from earth with the naked eye, and about 100 such flashes would be seen yearly. Since no such thing happens, is the moon totally "airless"?

That the moon can have no more than a trace of an atmosphere is evident, from the usual absence of a lunar twilight (rare exceptions have been reported) and the lack of refraction or light-bending when the moon's edge obscures a star. But an atmosphere 1/10,000 as dense as the earth's, at surface level, could escape detection by such tests. Even so slight a trace—which does exist, recent delicate optical experiments suggest—would have tremendous consequences.

Imaginative accounts have pictured lunar explorers bombarded with death-dealing meteorites, and forced to take underground shelter. But a trace of atmosphere would suffice to form a "meteor screen" and burn up most meteors before they reached ground, as on earth. The rarity of observed flashes tends to confirm that this is just what happens.



SIGNS OF LIFE ON MOON? Radiating spokelike from center to rim of Aristarchus, and a few other craters, dark bands resembling Mars' "canals" mysteriously wax and wane. They may be primitive vegetation. Sketch of banded crater, above, is adapted from one by author of moon guidebook.

Powerful ultraviolet rays of sunlight, another hazard anticipated for spacemen on the moon, may likewise be filtered out by a lunar atmosphere. But it must be so rarefied and devoid of oxygen as to be useless for breathing; explorers must bring oxygen along.

Space suits and above-ground living quarters must be insulated against violent extremes of heat and cold—the moon's surface temperature soars to 214 degrees when the sun is overhead, and plummets to 250 degrees below zero at night. Enduring such rigors may seem inconceivable to an earthman—but on the moon temperature loses its accustomed meaning, as there is practically no air to imprison you in a stifling blanket of heat, nor to drain the body's life-giving warmth with polar gales.

A voyager disembarking upon the near side of the moon, and looking upward whence he came, will see a perpetually black, star-studded sky. The glowing earth—four times as wide as the moon looks to us—always hangs overhead, swaying only a little to and fro. And the sun, a blazing beacon, journeys so leisurely across the heavens that a day is about 29 times as long as on earth.

In the sun's glaring rays, the lunar landscape will look as unreal as stage scenery under klieg lights. Its dazzling highlights and black shadows will startle the explorers, and they will have to summon up their courage to explore lunar craters that reach 183-mile width and 29,000-foot depth.

Rising like an island from the flat lava floor of the Ocean of Storms, majestic Copernicus, "Monarch of the Moon," measures 56 miles from crest to crest. Its ridged and gullied outer slope is a gentle one, and can be climbed with little exertion, since a 150-pound man weighs only about 25 pounds on the moon. From its crest some future Daniel Boone may look down 17,000 feet, past masses of tumbled rock, into an inner amphitheater as large as Rhode Island.

But when an explorer reaches the center of a crater floor, the outer walls may seem to have shrunk or even vanished completely! Why? Because the moon's curvature, much sharper than the earth's, will sink most or all of the towering ramparts below his horizon.

Lunar mountains surpass anything on earth in wild grandeur. For lack of any sea level with which to compare their altitude, it must be gauged by comparison with nearby terrain. Loftiest of all by this standard, the Leibnitz Mountains near the south pole attain a height of 35,000 feet, more than a mile higher than Mt. Everest.

Strange and varied formations await sightseers: "clefts" or gaping cracks in

[Continued on page 260]

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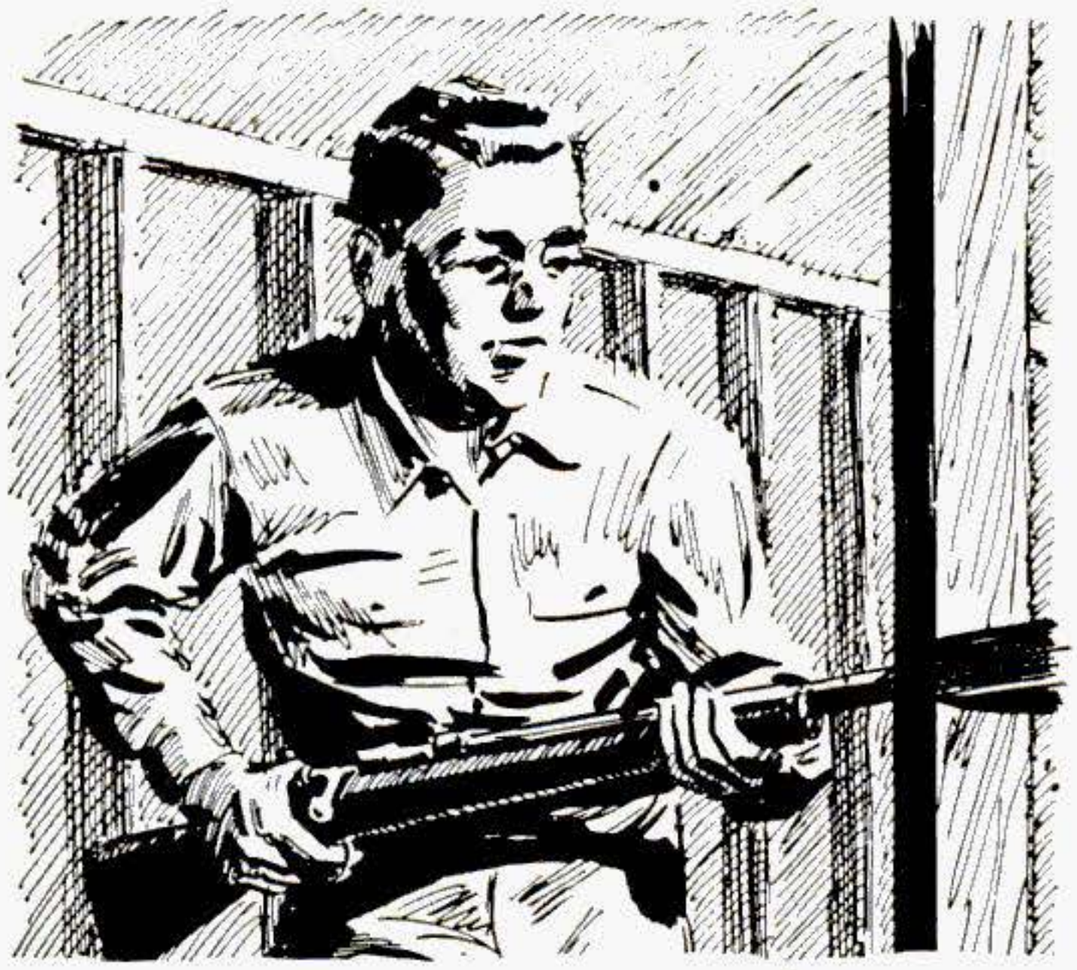
New Ideas

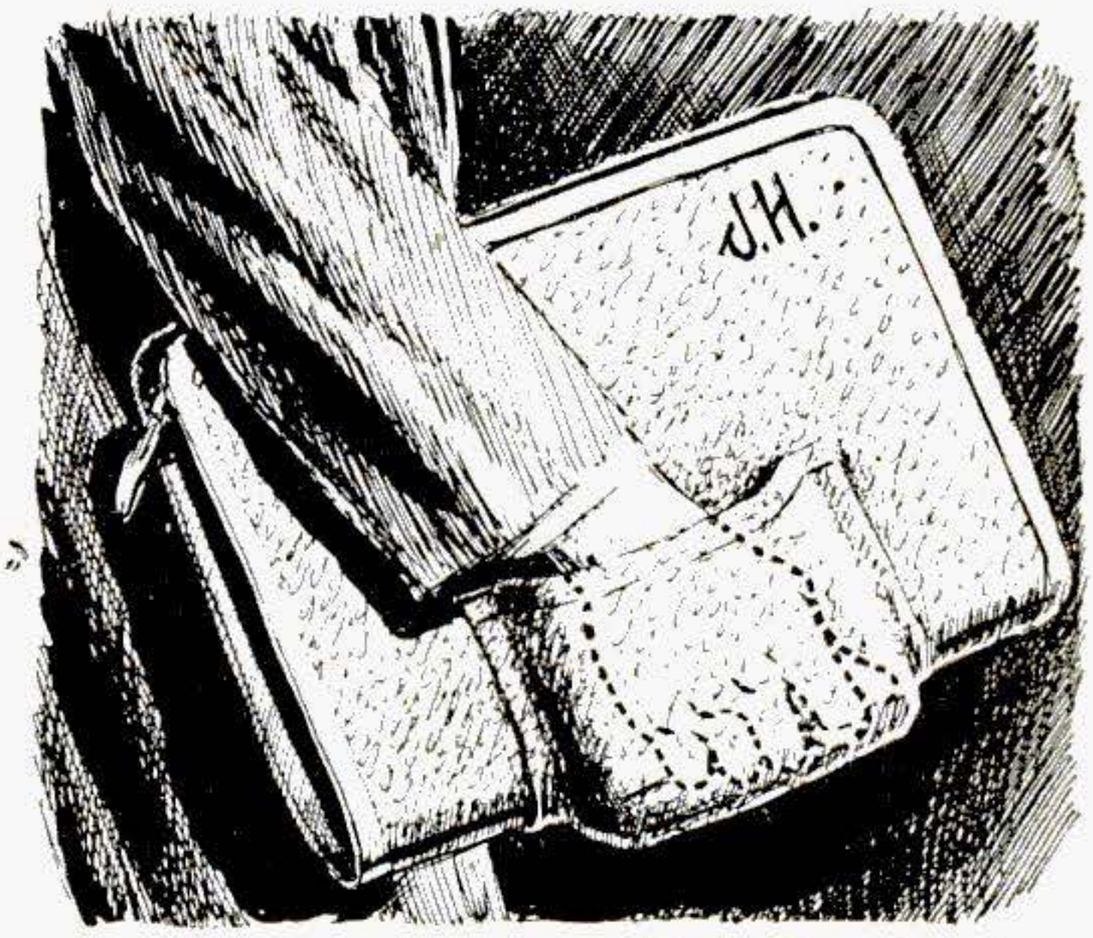
FROM THE INVENTORS



1 Rifle to Drive Nails. This nail-driving firearm would magnetically hold a nail —or a spike or rivet—and allow just the tip to project. The user would place the tip in position, then fire a blank cartridge. Exploding gases would ram a piston against the head to hammer the nail home.

2 Hand Crank to Power Boat. A duck hunter could navigate silently through marshes if his boat had this hand-driven prop and rudder. Enclosed gears would turn the propeller shaft noiselessly. Operator would sit in the back. A motor could also be used to crank the drive gear.

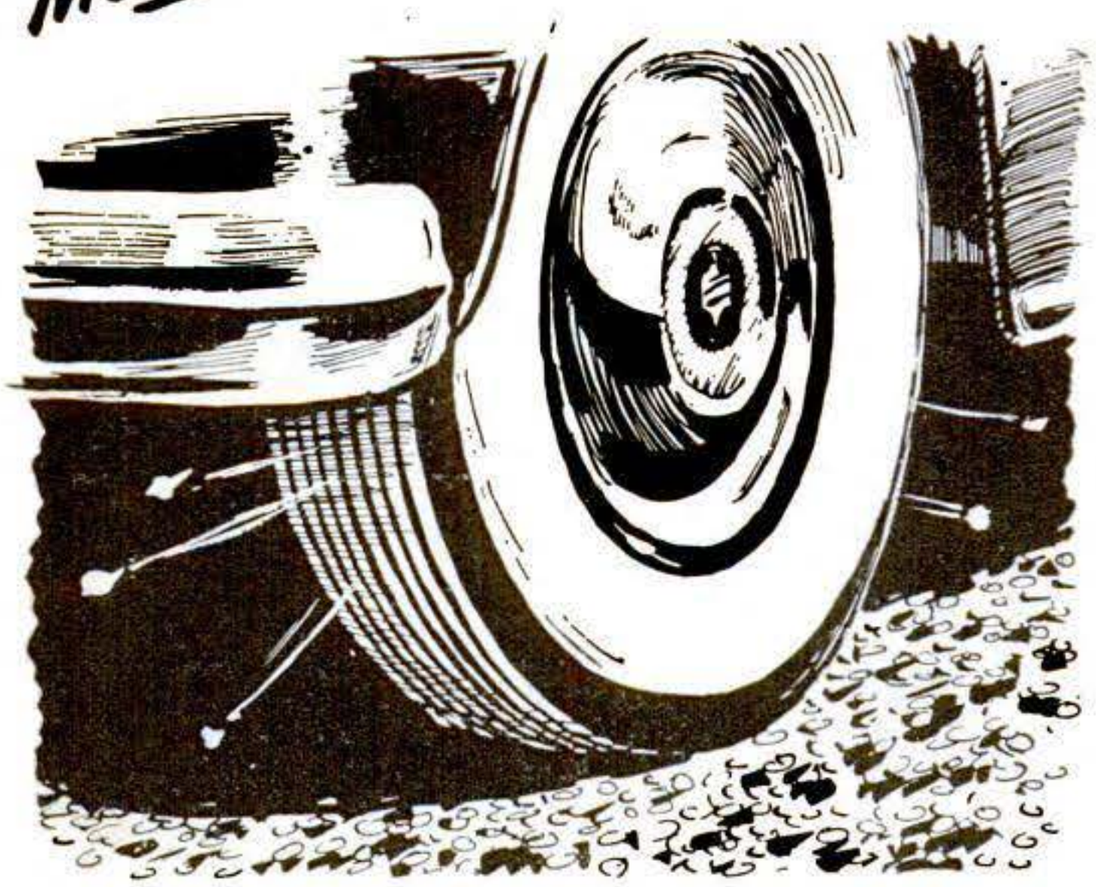
3 Heated Wiper to Deice Windshield. A windshield wiper, says the inventor of this new one, can handle ice, sleet and snow easily as long as the rubber squeegee remains wet and pliable. To keep it that way, he would put an electric heating element in the blade holder. It would radiate enough heat to keep the wiper from freezing up.



4 Brief-Case Mitt to Shield Hand. Salesmen, lawyers and other brief-case carriers would escape their usual harvest of chilled fingers if portfolios came equipped with hand-warming extra pockets. This glove would also help prevent loss or theft since the carrier's hand would be interlocked with the case.

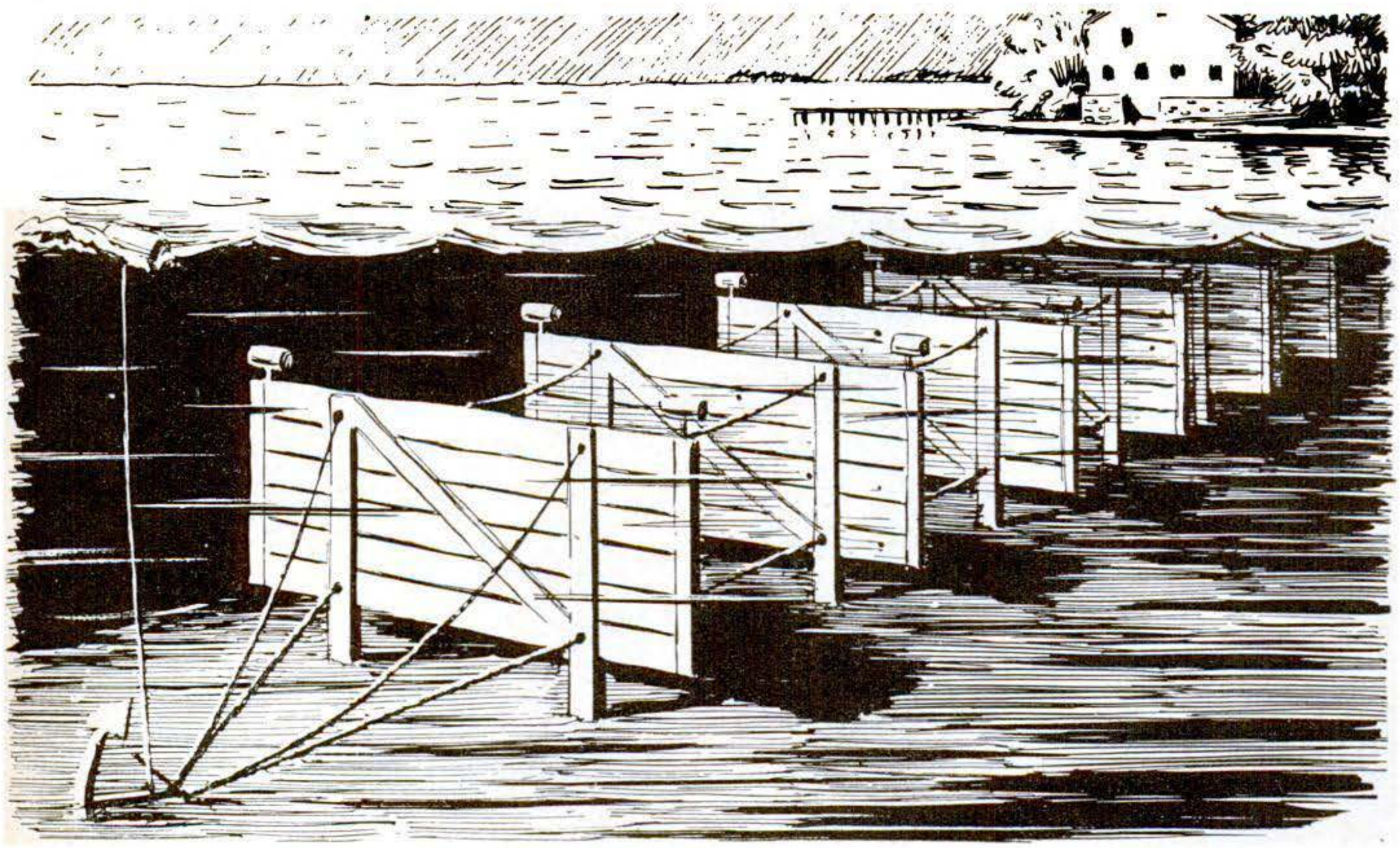
Please turn the page for more new ideas.

MORE New Ideas from the Inventors



5 Tire Grooves to Eject Stones. Undercut grooves would keep these tire treads free of pebbles. The undercut would narrow the groove at the point that touched the road, but would flex it open when the tread was not in contact with the ground. Only tiny stones could be picked up and these would be ejected as the wheel turned.

6 Stool to Be Worn on Leg. A farmer wearing this milking stool would just bend his leg when he wanted to sit down. The stool would come around to meet him. When he stood up, the stool would remain attached to his ankle, parallel to his foot. Carried this way, it would not interfere with normal walking.



7 Sluicer to Chew Away Sand Bars. Costly dredging could be avoided with a sluicer that uses water power to level channel-blocking sand bars. Planks battened together form the rectangular plates shown. A row of plates, with weighted feet, is chained together and anchored on top of a bar. As tides and current rock the plates, the sluicer sinks deeper and loosens and displaces the sand. The inventor reports that in a five-day trial a test model of the sluicer dug out a channel six feet deep, 40 feet wide and 200 feet long at the entrance to a New Jersey bay.

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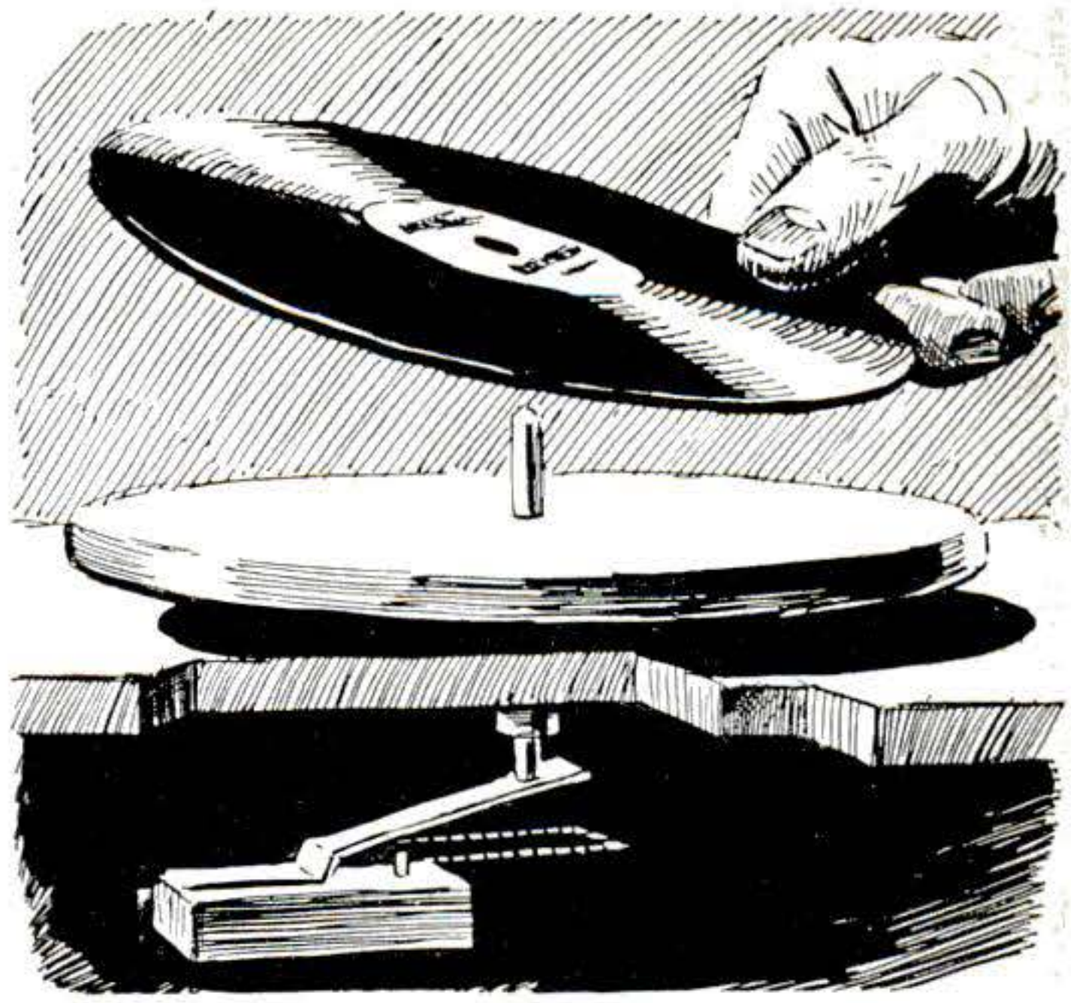
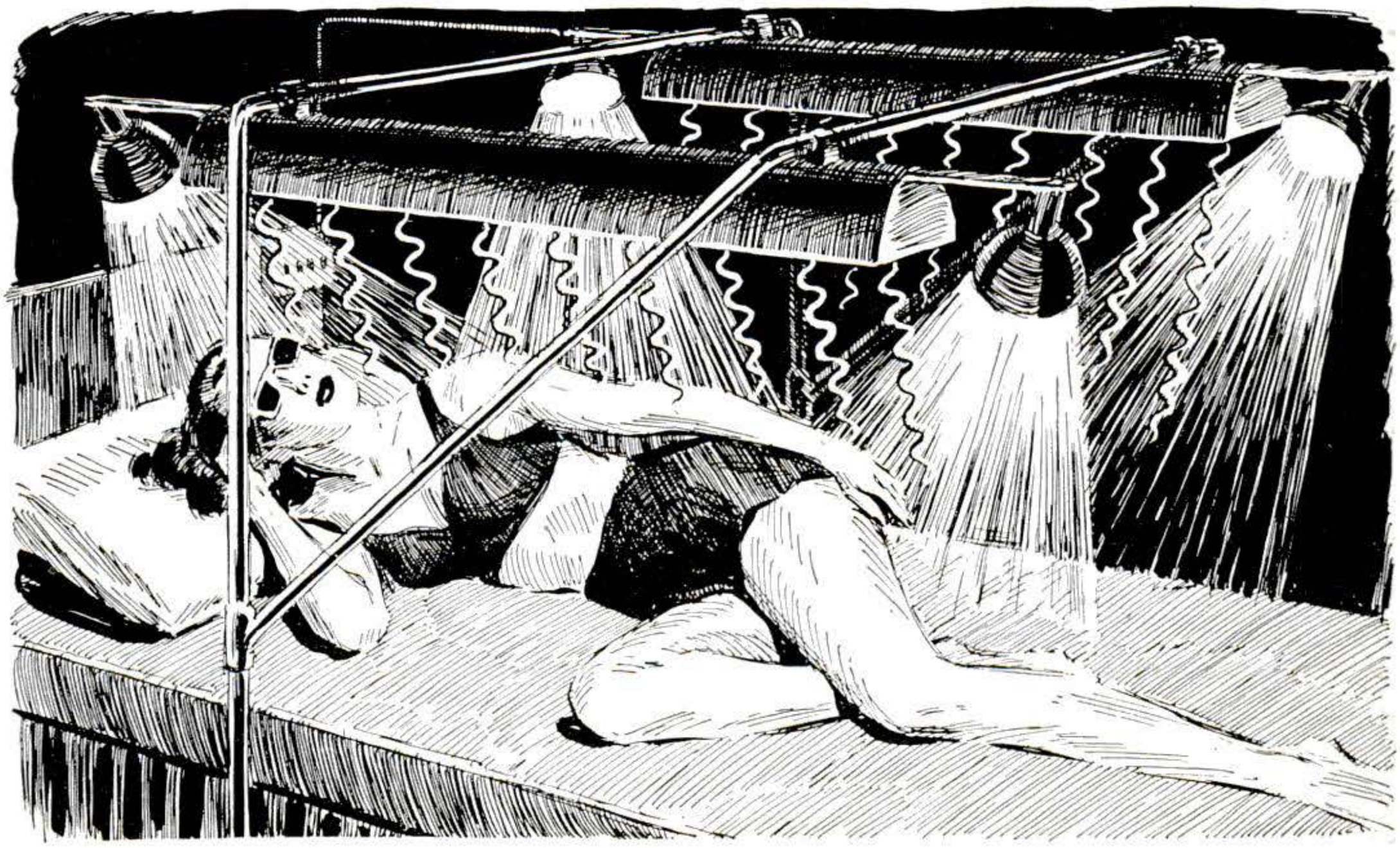
8 Meter to Count and Clock Calls. Most phone users would talk less if they could see their bills mount up. This device would both keep count of message units and remind a caller when to hang up. Dialing a number would advance the counter mechanism and start a timer which would then visibly tick off the minutes and call units.



9 Record Weight to Turn on Phonograph. You would not have to stop this phonograph motor when you wanted to change a record. Lifting the disk would do that job automatically. Putting a new record on would start it the same way. The weight of the record would press a plunger, opening or closing the motor circuit.



10 Heat Lamps to Replace Blankets. If bedcovers bother you, you might try this method of getting warmth without weight. Regulated sources of infrared or ultraviolet —minus the visible light—would keep you comfortably warm regardless of the temperature outside. The inventor says these invisible light rays would help induce sleep and could also be used to give you a sun tan while you slept.

U.S. patents on these inventions have been granted to: 1. Chester Tietig, Covington, Ky.; 2. Carl Stahmer, San Francisco; 3. William Eaves, Elyria, Ohio; 4. Elmer Lee, Minneapolis; 5. William Briscoe and Verne Berry, Detroit; 6. Le Roy Bannister, Lake Placid, N.Y.; 7. Christopher Montagna, Ocean City, N.J.; 8. Henry Feinstein, Brooklyn; 9. Gerald Carreau, New York; 10. Murray Clay, Chicago.

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Famous photographer shows how

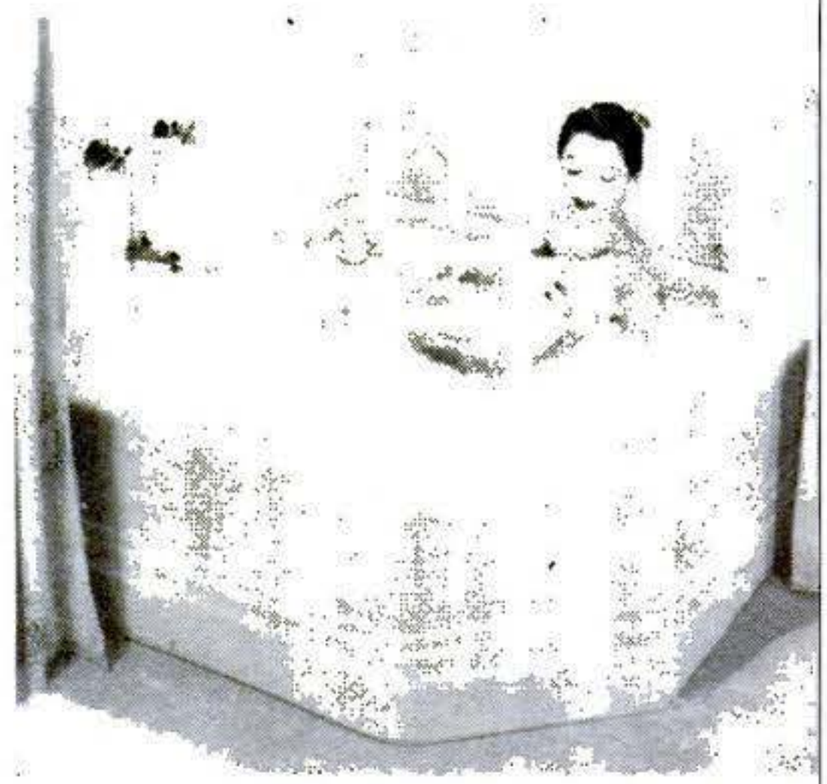
Practice Makes Perfect Pictures

Vic Keppler's assistants model his test photos, with results that are useful—often funny.

CHEWING the inevitable cigar under his bushy mustache, New York photographer Victor Keppler will tell you that the gent-in-the-bathtub and the bride-with-rolled-up-trousers were *not* shot for laughs. Funny? Sure. But that's incidental. These are test photos, made to insure that the final pictures—ones advertisers write fat checks for—will turn out right.

It's routine at the Keppler studio. With stage set, props in place, camera and lights adjusted, staff members—often including Keppler himself—stand in for models. The test is snapped and rushed through the processing lab. Then anything that looks wrong can be changed before the $20-an-hour professional models arrive for the real thing.

Keppler thinks amateurs might well copy his trick. It is not so simple with roll-film cameras. But if you want a good shot of a temperamental baby—or of equally temperamental Aunt Tillie on a visit—snapping a test roll a day or two in advance could be worthwhile.



Test-shot model forgoes the bubbles—but he's got his clothes on.

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Bedsheet doubles for bridal veil in this test for silverware ad.

Teddy bear won't wriggle, makes a good stand-in for a baby.

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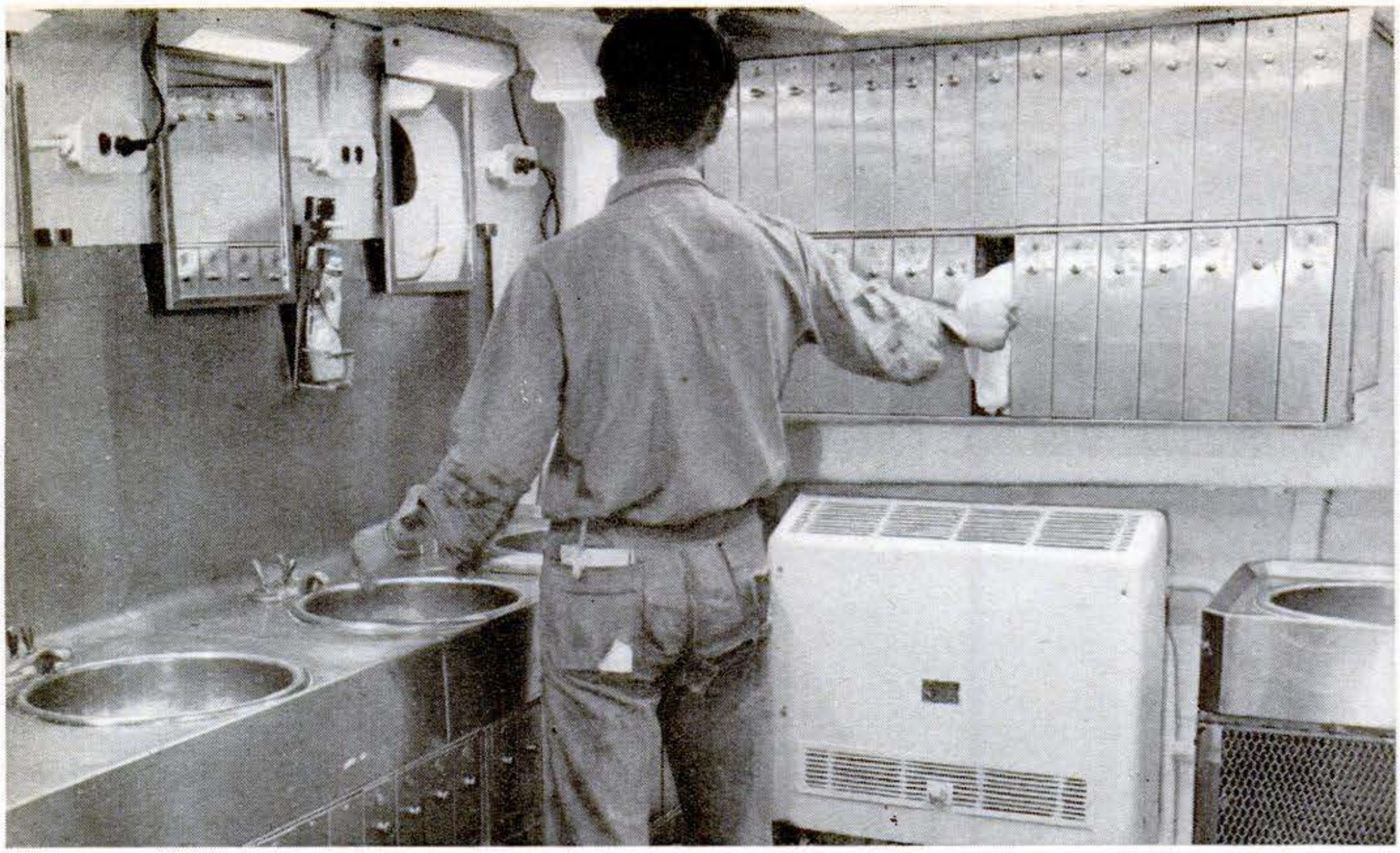

In the brighter, airier, made-over *Meredith*, towels are force-dried in individual lockers.

Sailors Get More Elbow Room On a Redecorated Destroyer

NAVY hands who formerly shipped on the destroyer *Meredith*, a typical drudge of the Atlantic Fleet, wouldn't know the old girl today. Outwardly unchanged, below decks she is a thoroughly altered vessel.

BEFORE REDECORATING, *Meredith* had one wash basin per 16 men, no place for towels to dry.

Colors—pale blue-green, gray, tan, coral, oxblood, dark blue and green—have been splashed over her bulkheads, furniture and decks. This makes her seem lively and inviting.

Fluorescent lighting has given her living quarters an air of cheerful brightness that they never had before.

Bunks have foam-rubber mattresses. New three-man gear lockers stand at the end of each tier of bunks, and beneath each bottom bunk are three sliding drawers for additional belongings. There's an occasional sofa, and even a piano.

Seats in the mess have backs, and the tables are less crowded than before. Hot food arrives by dumb-waiter, and odors depart by improved ventilation.

The *Meredith* will never be just like home, but the morale of her crew has shot sky-high since she became truly livable. Their increased efficiency enables her to get along with 37 fewer officers and men than she used to need.

A two-year study of the Atlantic Fleet urges that all the Navy's vessels be made as "habitable" as the *Meredith*.

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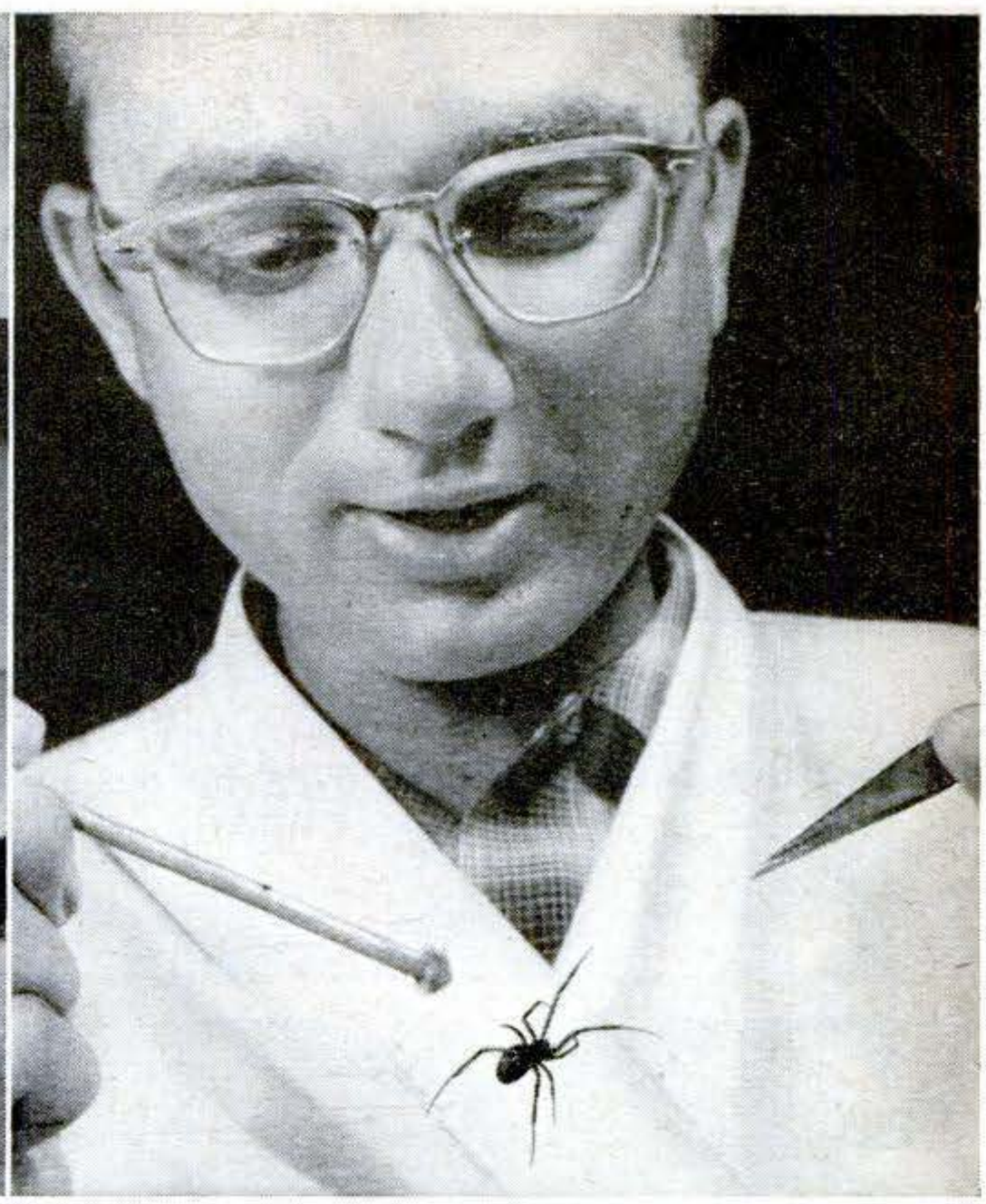
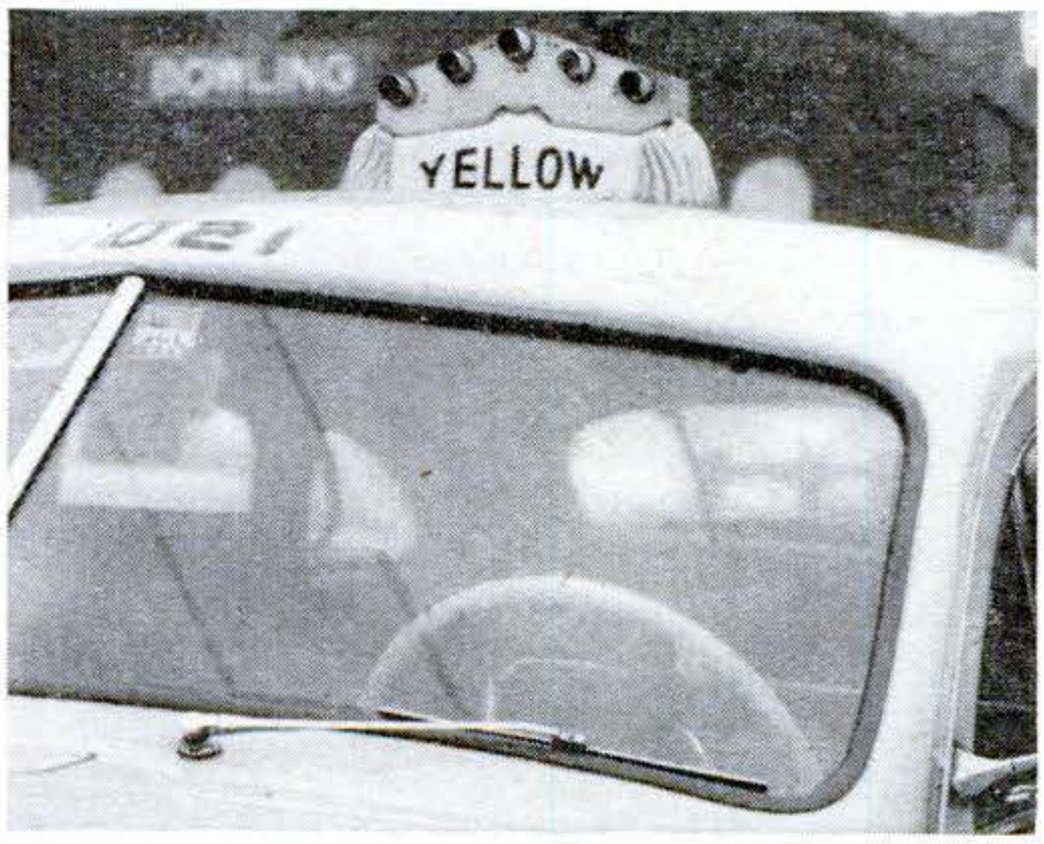


Black Widow Spins Web to Help Build Weapons for U.S. Army

THE black-widow spider above is a defense worker. Its web filaments are used by Northrop as cross hairs in microscopes and telescopes for Army tank sights. Tougher than steel, they are so fine that 5,000 of them laid side by side take up only an inch. At left, the spider is having a health check in the plastic box where it lives between jobs. At right, it has climbed out on a stick and is about to be shaken loose. As the spider falls on its back to the floor, it will spin a six-foot strand.



Colored Lights Tattle Speed

FLASHING colored lights on the roof tell traffic officers, pedestrians and other drivers how fast the cab above is going. An automatic selector unit sends impulses from the transmission to the lights. Blue, orange, green, yellow and red lights mark each five miles from 25 to 50 m.p.h. From 50 to 70, red flashes in combination with the others. Inventor A. R. Johnson of Chicago plans models for cars, buses, trucks.

Troops Ride in Armored Bus

THIS 10-ton monster will carry a dozen soldiers safely through a hail of small-arms fire and shell splinters. It's the six-wheel-drive Saracen, newest British personnel carrier. The vehicle carries a .30-caliber machine gun and a Bren gun.

▶▶▶ Movies of how the body fights disease are expected from a new way of keeping cells alive under a microscope inside an incubator. University of Pittsburgh scientists will add viruses, film results.

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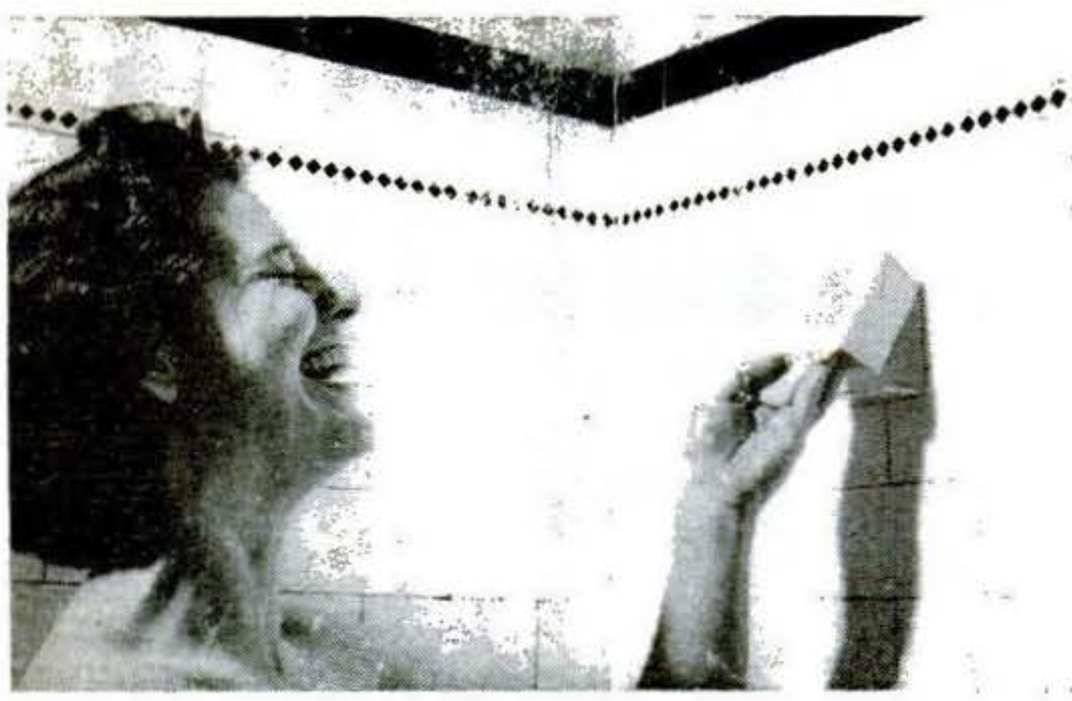
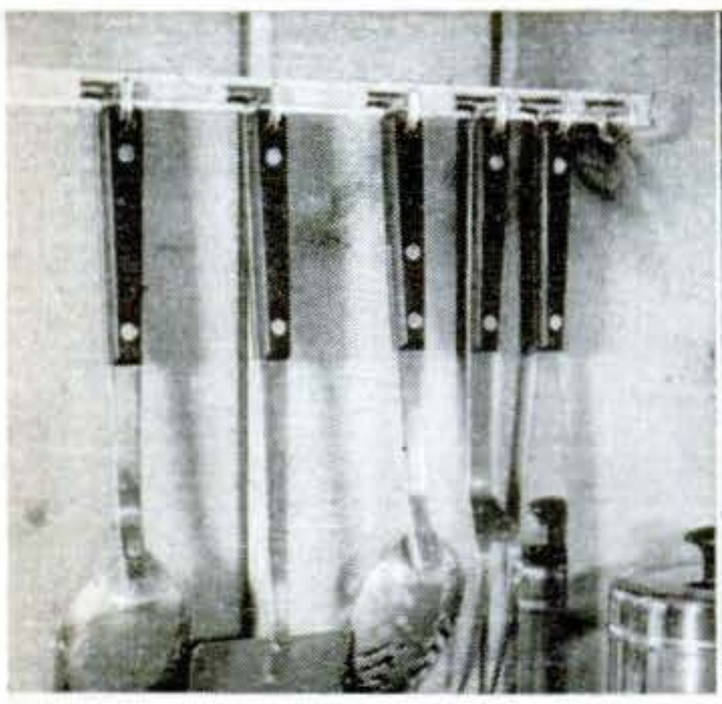
New Aids to Living...

1. Whistling tea kettle fits over various-sized pots to boil water for tea while dinner cooks—all on one burner.



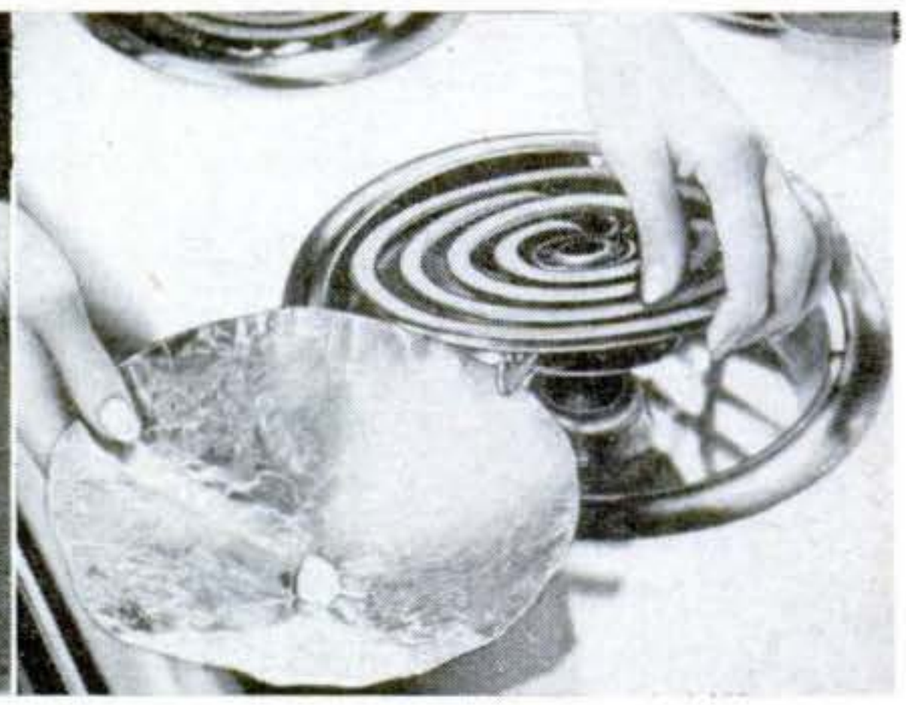
4. New soap holder mounts vertically on wall. Bar slips in at top, slides out at bottom when container is tilted forward.

5. To corral dust without mess, this basketlike fitting adapts older Electrolux cleaners to take disposable paper bags.



8. Sliding hooks on this rack zip back and forth so that kitchen tools or pots and pans of varying sizes can be hung without interfering with each other.

9. Record holder lets you sort and stack as many as 40 platters for an evening of music. Heavy black glass spindle has flock-covered plywood base.



10. Spill catchers of foil save a lot of scrubbing on an electric stove. These disks, precut to fit large and small burners, will save you scissor work, too.

Further information on these products can be obtained from: 1. H. F. Kutschbach, 24 Huebichweg, Bad Grund/Harz, Germany, B.Z.; 2. Phoenix Table Mat Co., 1718 E. 75 St., Chicago; 3. Reiber Cooler Co., Indianapolis; 4. Craft-Well Industries, 2348 Grant St., Berkeley, Calif.; 5. Vacuum Paper Bag Seat Co., 4817 New Utrecht Ave., Brooklyn, N.Y.; 6. Sherness Co., 4356

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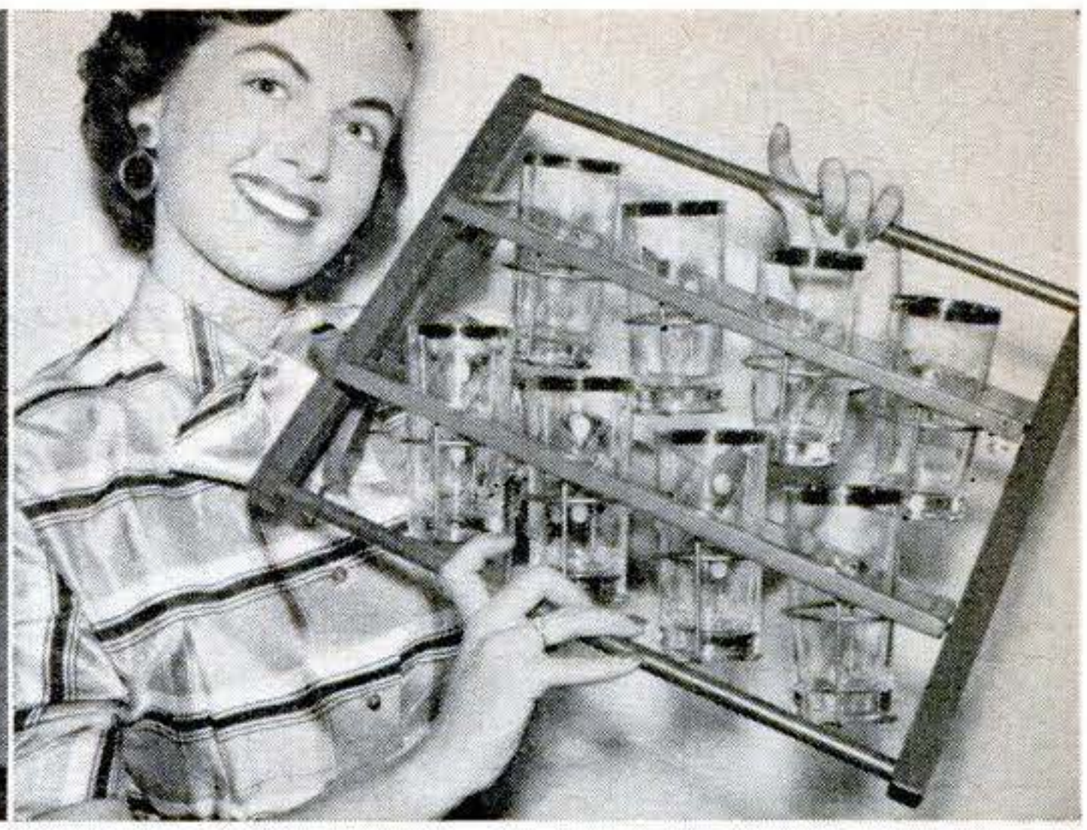
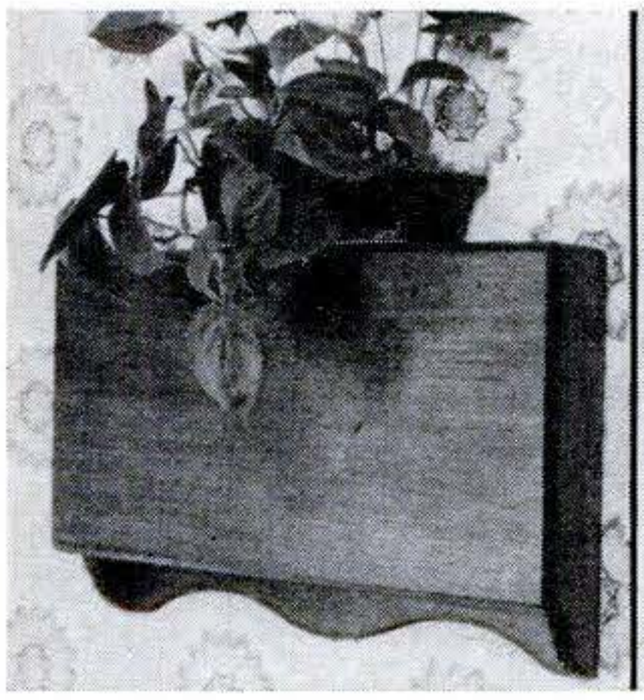
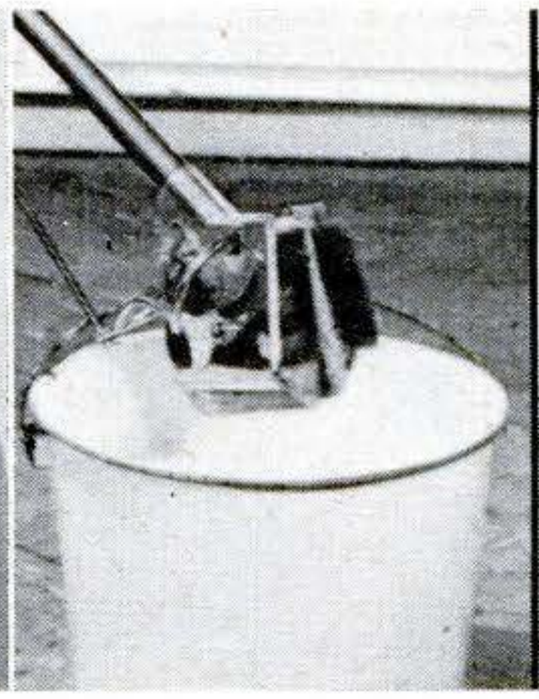
2. A swipe with a sponge wipes away grease and smoke when stainless-steel mats protect wallpaper behind the stove.



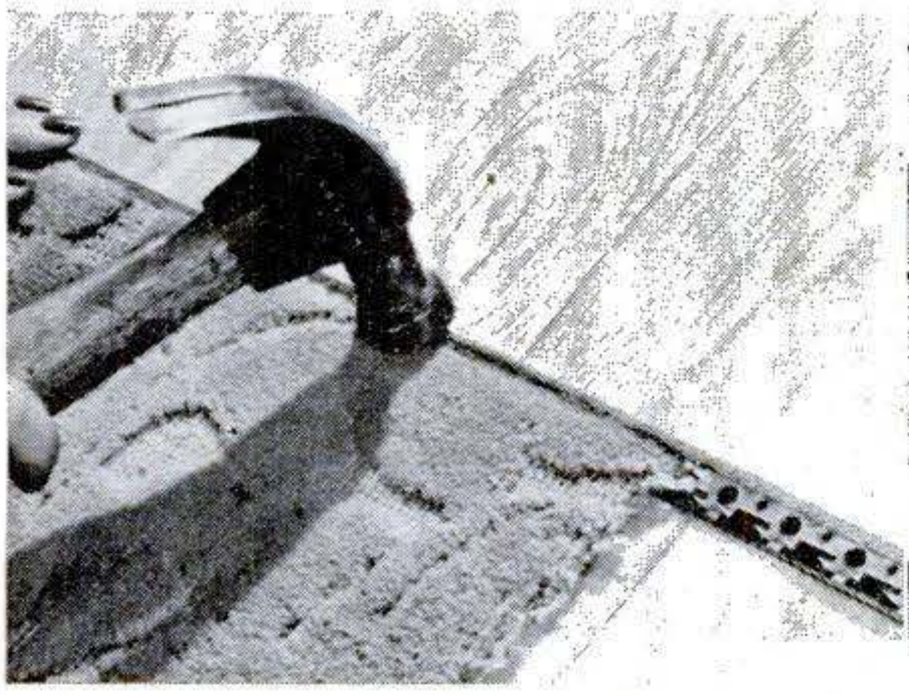
3. Drinks are on the level no matter how you tilt this tray. Pivoted holders in a swinging frame keep glasses upright.



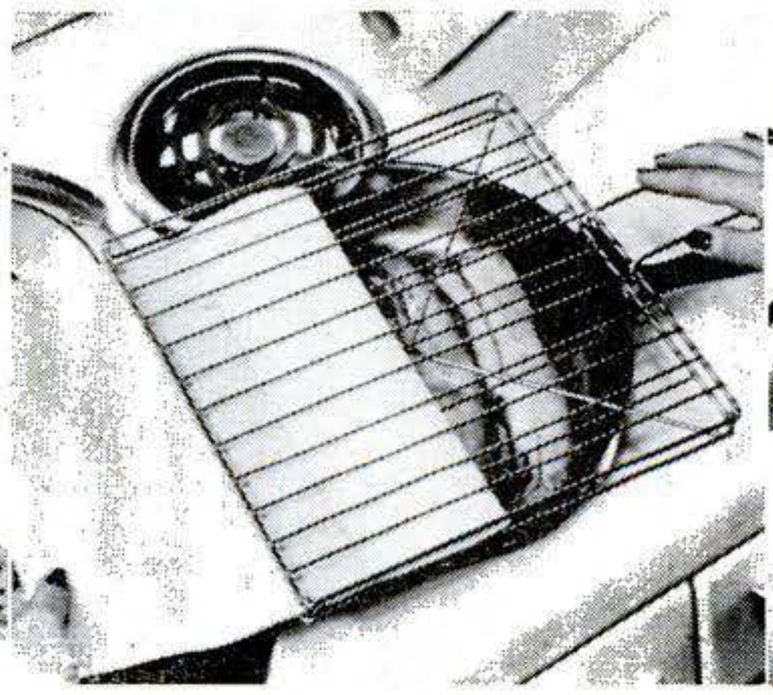
6. Guest closet in disguise extends four inches from wall when closed; opens to hold six coats. Lifted front checks hats.



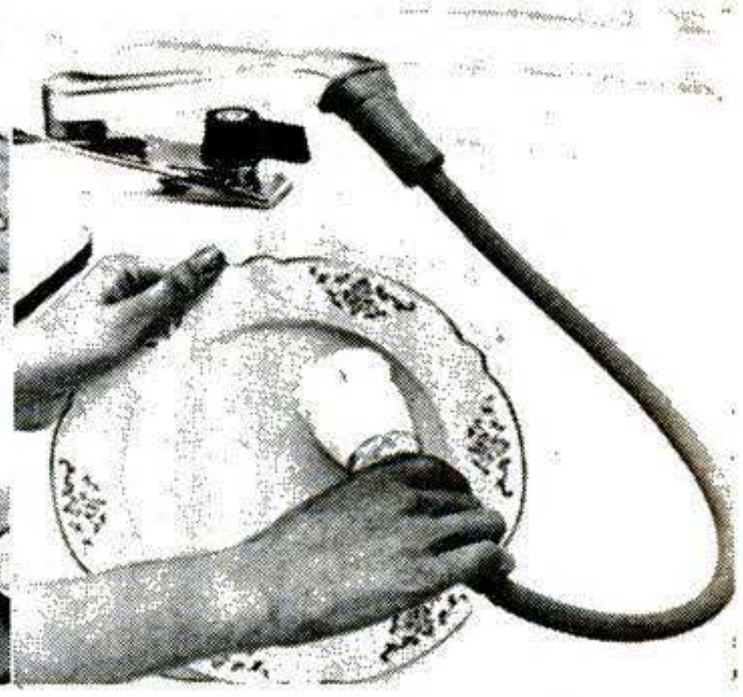
7. Sponge mop scrubs nine-inch-wide swath. Sliding metal sleeve forward on handle bends sponge in half to wring it dry.



11. Rug binding is a cinch when you do it with a hammer instead of a needle. Tapping the metal teeth on this textile edging clamps it over the carpet.



12. Skillet lid is a cake-cooling rack with paper towel inserted. Also serves as a draining stand for fried foods. Insert foil instead and it's a broiling pan.



13. Hitch it to a tap and water pouring through this brush will scrub china and glasses in jigtime with no need for the dishwasher to soak her hands in water.

Nicollet Ave., Minneapolis; 7. Buff Products, 200 Williams St., Port Chester, N.Y.; 8. Gary Alan Industries, 1026 Milwaukee Ave., Chicago; 9. Keencraft, 206 Lincoln St., Medford, Ore.; 10. Central States Paper & Bag Co., St. Louis; 11. Cyemba Sales Corp., 120 Wall St., NYC; 12. Larry Wright Co., 420 Market St., San Francisco; 13. Quicki Products Co., Box 31 Sta. F, Toledo.

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Scientists Probe Glaciers

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for Tomorrow's Weather

From deep in Alaskan ice comes the forecast of a mild winter in 2053.

By Gardner Soule

IS THE Arctic getting warmer? Is the world? Was it ever warmer than it is now? Why are most of the world's glaciers shrinking?

And why has one fascinating glacier, on the Juneau Ice Field in Alaska, continued to advance while other glaciers, including those near it, have been shrinking?

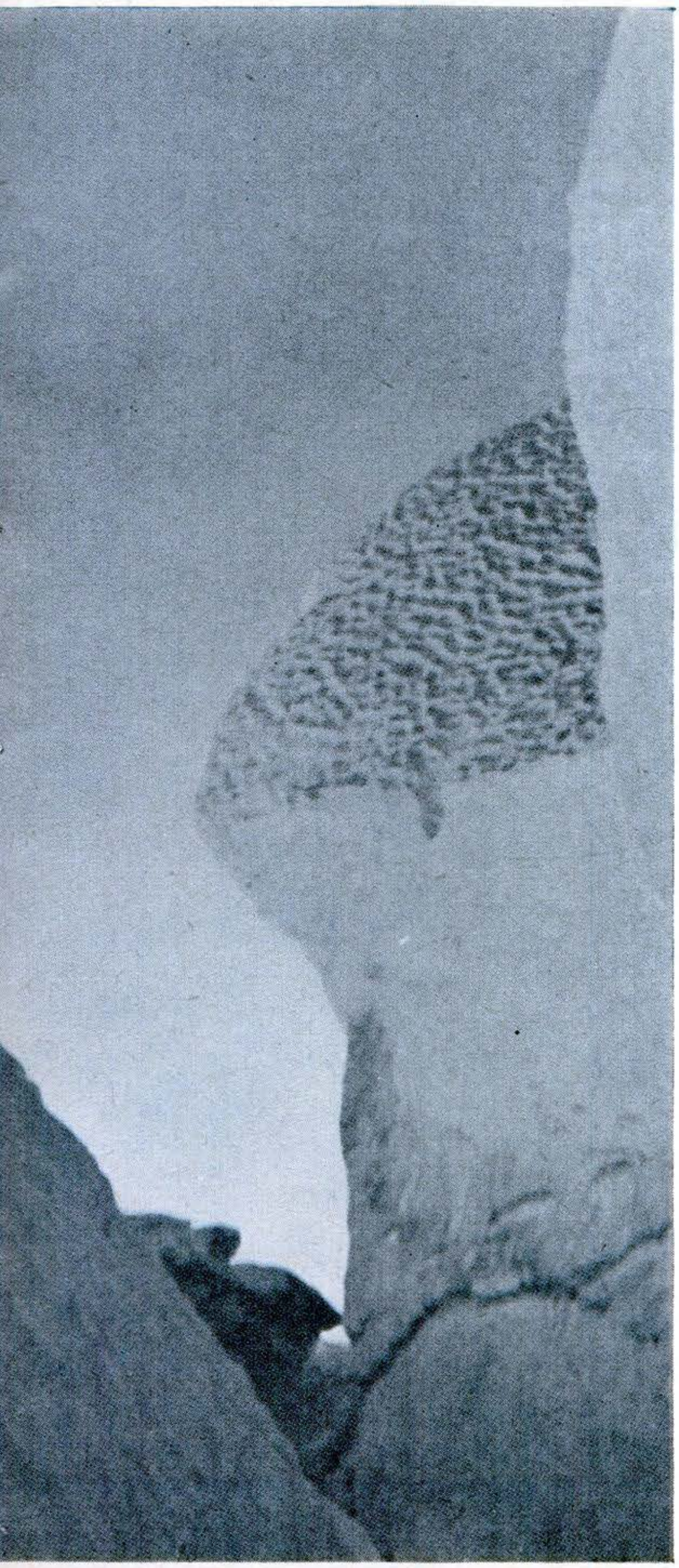
These are deep questions, and scientists are boring deep holes into the ice to seek the answers. If such questions could be answered, weather predictions, not merely for tomorrow but also for centuries, might be made.

The mysterious, growing glacier in Alaska is called Taku. It has lengthened 3½ miles since 1900. The American Geographical Society, for the past six summers and one winter, has sent expeditions to study this glacier.

Reading the Future from the Past

As a glacier grows, it freezes into its layers of ice a record of hundreds of years of weather. By studying samples of ice from different layers, you can sometimes tell what happened long ago. And from the past, you may read the future.

Drills bore into Taku from towers



EXPLORER **Wearing a white helmet, dark goggles and short-sleeved shirt, member of Taku glacier expedition cautiously prepares to descend into crevasse opened by the warm summer sun. The explorers found sunburn more of a hazard than frostbite, hardly ever caught cold.**

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FLYING SLED Albatross flying boat is the newest of planes designed to open the Arctic. A long, narrow runner under the hull lets it land and take off on snow or ice without wheels or skis. Plane can also operate from open water.

that look like oil derricks and bring up samples of ice from hundreds of feet down. The explorers dig 15-foot-deep pits into the ice, take more samples, then turn the pits into laboratories, work in them, and analyze ice crystals right on the spot. They also descend into the crevasses of the glacier.

This is new in exploration. Men in the past always have hurried to cross the crevasses as they tried to reach something like a mountaintop or the North Pole. Now men have learned that chasms contain secrets found nowhere else.

"It's a weird feeling," says Dr. Calvin J. Heusser, a 28-year-old Oregon State botanist, who has been on three of the trips to Taku. "It's a blue world down there, an ethereal blue, a phenomenal blue.

"It's very strange to be 50 feet down in this blue world, and to be looking up at the tiny slit above you."

Why should a botanist choose the Arctic as his field of exploration?

"I've found," Dr. Heusser says, "103 different flowering plants on the *nunataks* (mountains and hills that stick out above the ice).

"There are blueberries, grasses, buttercups, ferns. There are club mosses, which grow in chains like Christmas wreaths.

"There are dandelions and goldenrod and flowers of many colors. Up to the timber line, 3,300 feet, are the trees, alpine fir and mountain hemlock."

Plants Flourish in the Arctic

Taku glacier, only 25 miles from Juneau, is in the sub-Arctic. Yet because it rises to an altitude of 6,000 feet, it is Arctic in its conditions. Botanist Heusser therefore has observed plants living and flourishing in an Arctic environment.

Since 1948, the geographical society has sent dozens of scientists to Taku—geographers, geologists, physicists, meteorologists, glaciologists (glacier experts), others. Backed or assisted by the Office of Naval Research, the Army, the Air Force, the U. S. Forest Service, the

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Arctic Institute and other groups, the men have taken good, long, scientific looks at Taku.

Ever think of the Arctic as frigid, lifeless, white, silent?

It isn't.

Meteorologists took detailed weather records. In summer, the air temperature often reaches 70, at night it usually goes no lower than the 30s, and in winter it goes down only to the winter temperatures of the U. S. Midwest.

The men camped out for days on the ice with only a poncho under a rubber mattress. The only epidemic of colds came from visitors who arrived by plane from civilization and distributed their sneezes among the men on the glacier.

Everything from Bears to Hummingbirds

If the climate permits men to work and live, what of animals? Botanist Heusser is an ecologist—that is, he is concerned with animals and plants and their relation to each other. From the start his eyes were open for animals. Instead of only the occasional polar bear or seal that some explorers have reported, he has quite a story:

"I've seen the brown bear," he says. This is the biggest bear—11 feet long, over 1,000 pounds. "We've found his tracks as big as pie plates. The black bear is there, too. There are mountain goats on the mountains around the glacier. There are wolves, deer, wolverines, marmots (fur-bearing rodents of the ground-hog family), ptarmigans (heavy-feathered birds of the grouse family), snow buntings.

"I've even seen a hummingbird.

"Squirrels just like those in your yard scamper across the ice.

"We're often harassed, out on the ice, by bushy-tailed wood rats that move into and live at our camps. They eat chocolate, oatmeal, crackers. Anything that's not canned."

Dr. Heusser learned too that the glacier itself was full of—of all things—insects. "Dozens of ice fleas are on the surface of the ice," he says. "Ice worms, too—tiny, wiry creatures. And spiders,

HISTORIANS Descending into crevasse, scientists trace weather of the past in layers of ice built up over many centuries.

PROPHETS Cores of ice taken from crevasse walls are studied for clues to long-range climate trends that may forecast weather of future.

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too—you'll see half a dozen as you put down a tent."

Is the Arctic silent? The Taku Arctic was—except for the wind (howling), avalanches (thunder and crashing), the calls of birds and animals, the gushing of water in the crevasses, and a good many other sounds. The glacier itself, he says, moves downward by shocks, and you can even feel the glacier move when you're camped upon it.

Is the Arctic white? "Only," says Heusser, "when you're caught on the snow in a fog." There are the browns and grays of the *nunataks*, the greens of the plants, and not even all the snow stays white. In snow cups, the round surface pockets caused by melting from the sun, there were one-celled plants called algae that turned the snow red.

"And the sunset is another thing that can turn the snow red," says Dr. Heusser. Sunsets are magnificent. Harsh reds, oranges, blues, blacks—no pastels.

"It makes you feel all's right with the world, and is a big reason you go up there aside from scientific purposes."

At night the northern lights add more color—green, blue, silver.

What secrets has the ice itself yielded? Though the evidence is still preliminary, some things appear clear.

ALUMINUM HUT kept researchers comfortable on Taku all winter. Walls are layers of aluminum, tar paper, glass fiber and wallboard.

Long-Range Forecast: Warm and Dry

It was a very warm world, warmer and drier than now, about 3,500 years ago. Then there was a short ice age that started about the time of Christ. Then the ice started to recede about the time of the American Revolution. And it is receding still.

Ice, which still covers 10 percent of the earth's land surface, is dwindling.

"The trend," says Dr. Heusser, "is toward a warmer, drier climate."

Predictions: If this trend continues, ports that are icebound will open. Other northern ports will become ice-free for longer periods. Winters will get warmer, summers hotter. Some torrid places, in the tropics or on deserts elsewhere, will dry up so much that they will become uninhabitable.

All of these things, the American Geographical Society points out, have occurred somewhere on earth during the past few years.

And man, knowing that he is right in the midst of a period of climate change, is for the first time actually studying the change and learning what is going to occur as a result.

But there are mysteries still to be solved.

Taku and one of its neighbors, Norris glacier, reach an inlet of the Pacific, less than a mile apart. In this time of gradually warming weather, Norris, as would be expected, is receding; its ice and snow are less each year and Norris is drawing back up toward the mountains and away from the ocean.

Taku, on the other hand, shrank (as it should have) till about 1900, but then switched and has been advancing ever since. Today it pushes into the Pacific icebergs as big as office buildings. Why should this be so? With the same warming weather, and identical climate conditions because they're right next to each other, how come one glacier is getting bigger while the other melts?

Are Taku, and the very few other glaciers known to be growing, simply misbehaving in this world-wide period of increasing hot weather? Or is Taku—could it be—an indication that the world is about to reverse itself and start cooling off?

So far the dozens of scientists who have tried to figure it out can say only: "We don't know." END

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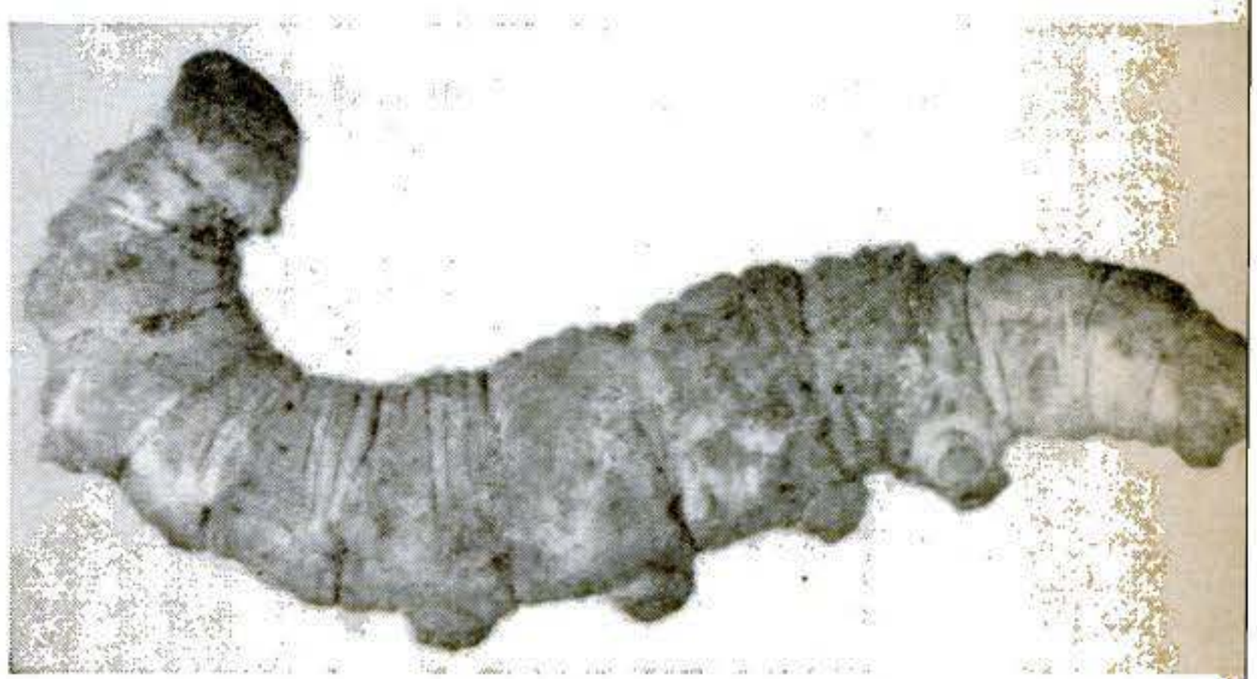
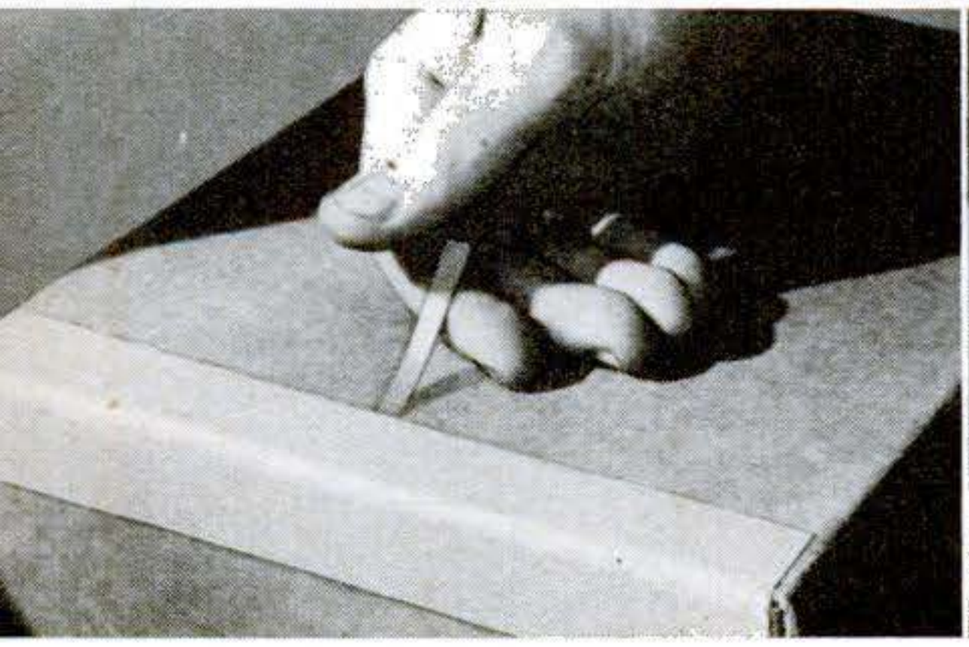
Basketwork Roller Rebuilds Roads Right on the Spot

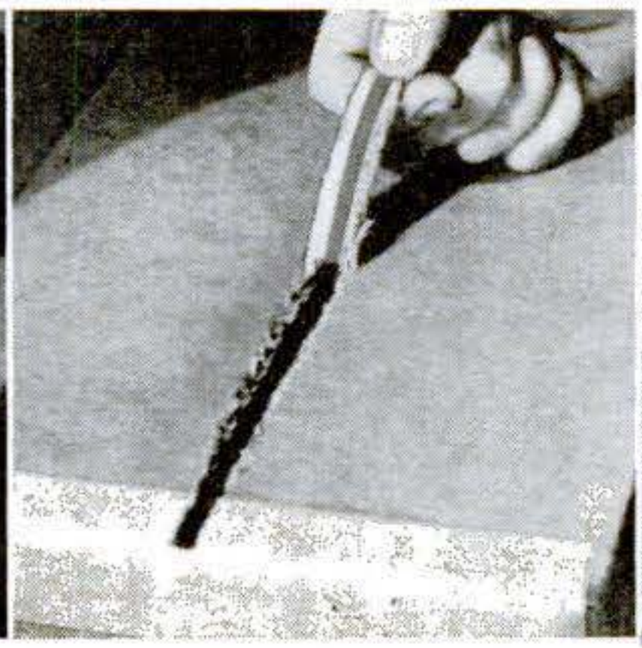
THE odd-looking roller above makes new roads out of old ones. First it crushes an old bituminous surface into re-usable aggregate right on the road. Then the aggregate is bladed aside while the roller compacts the base for a new surface. This is made by mixing fresh binder oil with the old aggregate—and turning the roller loose a third time to roll the mix level. Made by the Hyster Co., of Portland, Ore., the Grid Roller consists of interwoven 1½-inch steel bars and can be weighted to produce pressures near 1,500 pounds a square inch at its small contact points. At left above is a loosened road surface after one pass by the roller; at right, after four passes.

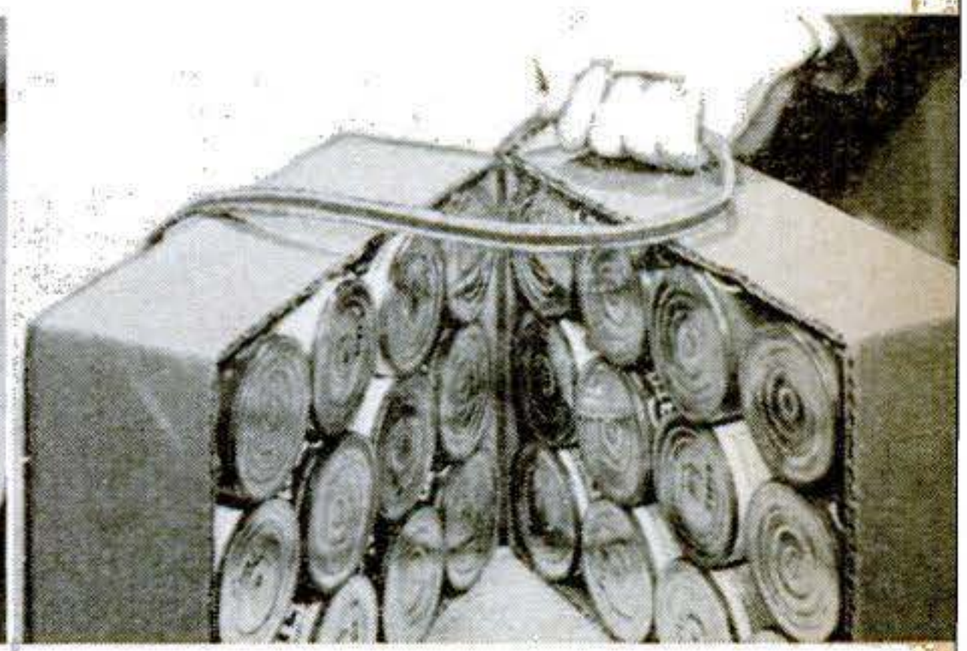
Caterpillar Is Older Than Man

IT'S been a long time since the caterpillar at right munched a leaf—25,000,000 years. Every wrinkle is there, but the insect is solid stone, fossilized during Miocene times when man was still evolving from a primitive ancestor. It's part of a rare find of perfectly preserved fossil insects made in Kenya, Africa, including beetles, ticks, worms, spiders and grasshoppers.









Built-in Tape Opens Heavy Cartons Like Pack of Cigarettes

JUST pull the tape, as shown above, and a sturdy carton splits apart. The filament tape comes laminated to the fiberboard and an end is left sticking out of a corner joint when the box is made up. A product of the Minnesota Mining & Manufacturing Co., the tape is strong enough to rip apart a box with 350 pounds' bursting strength.

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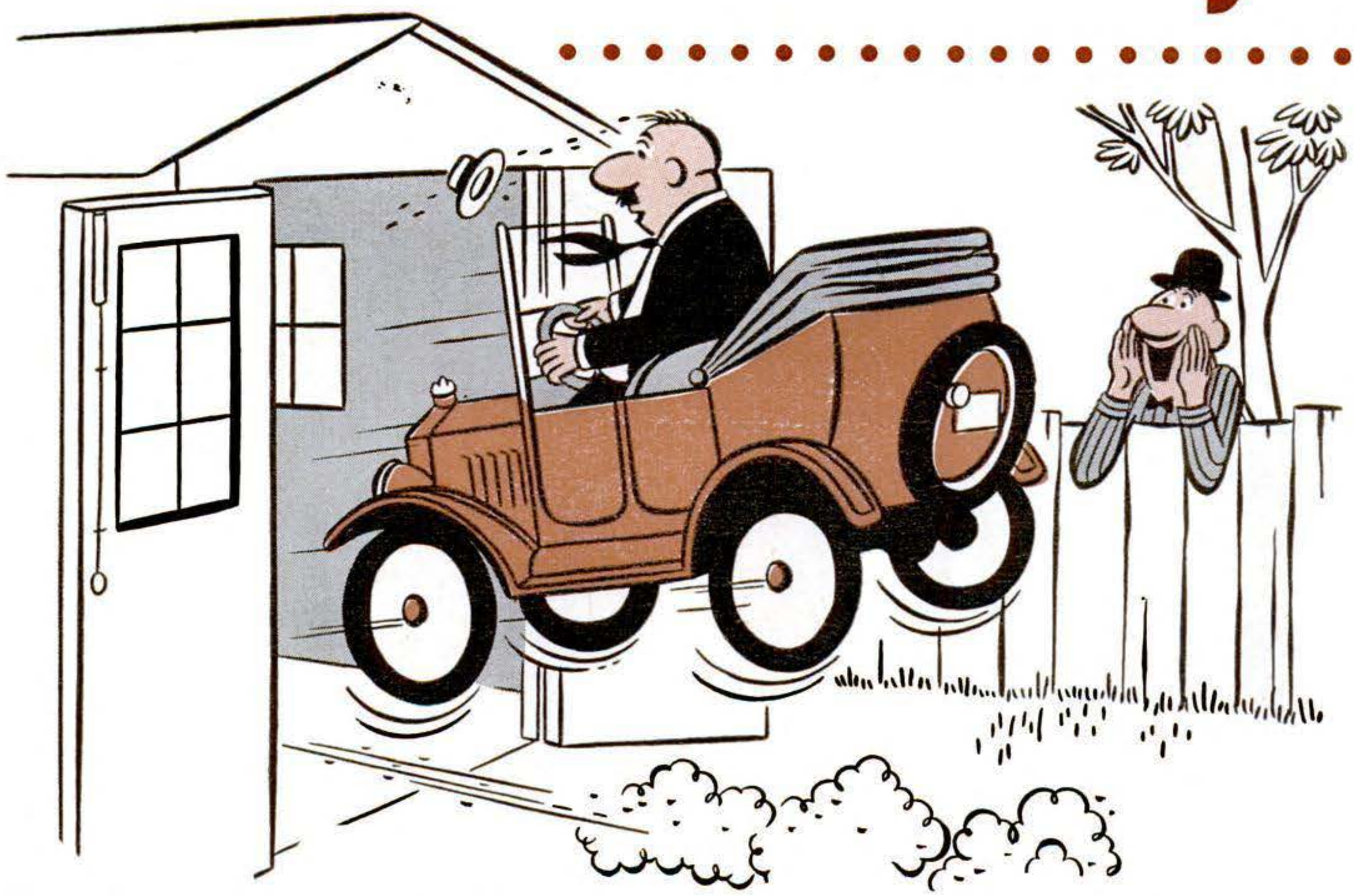
Grand Champion Model T Story



IN APRIL, 1922, my father got to feeling his oats, and decided to spend his money for something profitable. After much persuasion by his boys—there were seven of us—he decided to invest in a car.

He had always said that if he bought a car, it would be a Ford. He went to see the dealer that afternoon about purchasing a Model T touring car. He paid cash for the car, and the dealer took him out and demonstrated it. When Father came back, he was well versed in the art of driving, and told us to get in. We climbed in and Father started off.

Father drove right home, for he was anxious to show it off to his neighbors. He got home the same time that Herb, our neighbor, arrived home from work. Herb saw Father come down the road at a faster than safe speed and turn into the driveway. He drove into the garage with a very dignified look, which was to be quickly deflated. He no sooner got into the garage than he hit the wall. In his excitement, he stepped on what he thought was the brake, but it turned out to be the reverse pedal. The car bolted back out of the garage faster than it had gone in.

"Ha, ha, ha!" laughed Herb. "Why didn't you leave it in the garage?"

"Well," said Father excitedly, "why didn't you shut the door while I had it in?"—*Andrew Piper, Caldwell, Idaho.*

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Idaho man wins 1925 Ford with his tale of a Tin Lizzie with a mind of her own.

ON THE opposite page is the best—in the judges' opinion—of nearly 3,000 stories which were sent in by readers of POPULAR SCIENCE MONTHLY about "My Funniest Experience with a Model T Ford."

The writer, who thus wins PSM's reconditioned Model T, is Andrew Piper, a 40-year-old Caldwell, Idaho, farmer.

An old hand with Model Ts, Mr. Piper drove a 1926 Ford as his family car until four years ago. Now he drives a '51 Plymouth—which he plans to keep, he says, using his "new" Ford, a 1925 runabout, "just for fun." He and his oldest son, 15, intend to join an antique-car club with it.

Judges Also Liked These Model T Stories

IN 1926 I was living in a small village in the north of England and owned a 1925 Model T. The local magistrate was also a proud owner of the same model. Naturally, we both took a lot of ribbing.

One day I stopped at the barber's on Main Street and got out of the car, leaving my dog sitting inside. Seeing a bunch of my friends, including the magistrate, outside the general store about 30 feet away, I walked over to them and got a lot of ribbing from one who owned a pony and trap.

I said, "My Lizzie can do anything your pony can do."

"I would like to see it come to you when you whistle," he said.

With that, I turned around and gave a shrill whistle. Imagine my surprise to hear the car start up and come bucking towards us, conking out about six feet away.

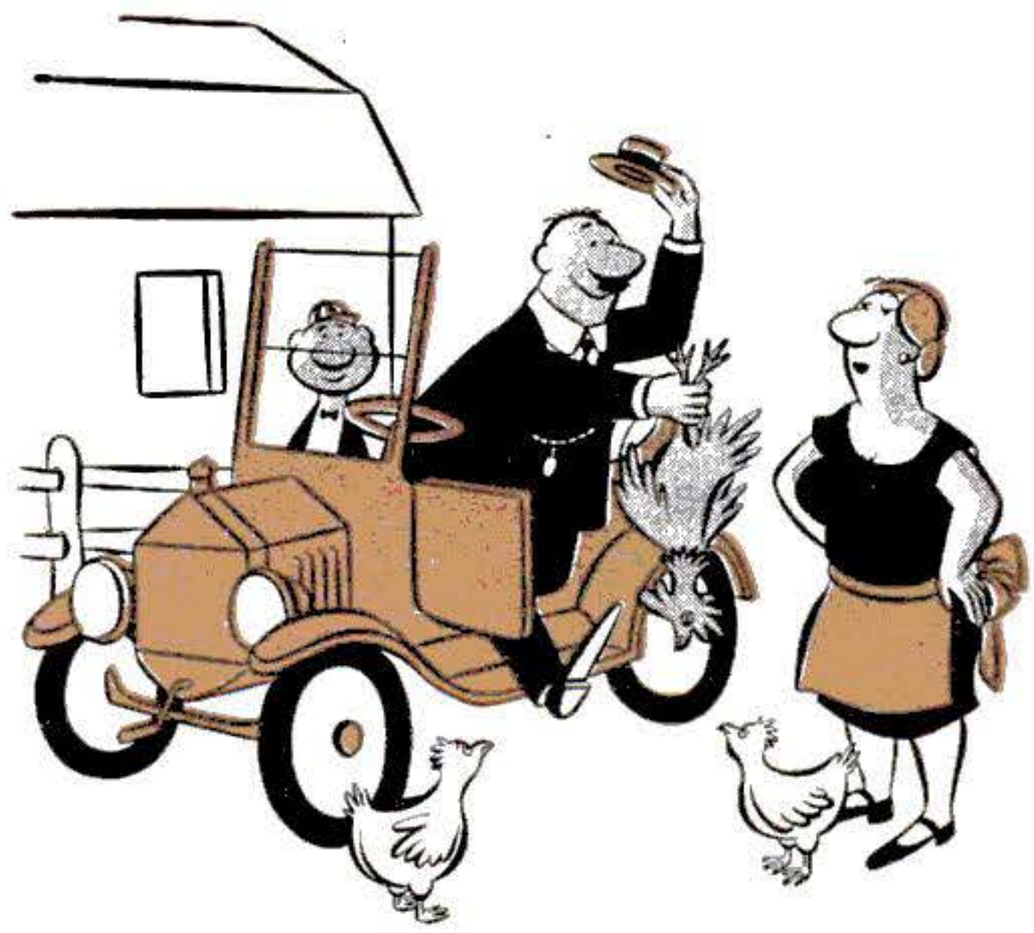
I knew what had happened. My dog, hearing my whistle, had jumped toward the dashboard and somehow knocked the switch on. The car was very hot, and it started up, as all Fords could do in those days. I also used to leave it in high gear, as the brakes were not too good.

The magistrate gave me a summons. The charges were: letting an unlicensed person drive, allowing the car to be dangerously driven, and damaging public property. (It broke down a sapling in its headlong dash.)

The magistrate was as much puzzled as the rest of them, and came over to my house that night. He said, "I will have to fine you 30 shillings in the morning, but I'll pay the fine for you if you teach me that trick."

After swearing him to secrecy, I explained what I thought had happened, and he, being a good sport, paid my fine.

As far as I know, those people are still talking about the car and guessing how I performed the trick.—*Samuel Slenn, Philadelphia.*



BACK in 1929, my dad and I were driving down a country road in our 1925 Model T. We ran over a rooster, which had run across the road in front of us. We noted a farmhouse sitting back from the road about a quarter of a mile, so we turned around and drove over to-

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ward it. A lady came out as we drove up. My dad climbed out of the Model T, carrying the dead rooster with him.

He said, "Lady, we ran over your rooster and want to pay for him."

The farm lady looked our Model T over carefully and said slowly, "Aw, that's all right, Mister. If he couldn't outrun that car, he couldn't catch a hen anyway."—*Steve Thomas, Crane, Tex.*

IN 1938, I was working for Burns' Grocery & Market in St. Jo, Texas, as delivery boy and clerk. For a delivery truck, Mr. Burns had a Model T Ford pickup, formerly owned by his father. It had been given excellent care.

On Saturdays, which were always very busy days, I worked in the store all afternoon until the rush was over. Then, around 5 o'clock, I started making my deliveries. On one particular Saturday, I loaded up the Model T with bushel baskets of groceries and started my rounds. I stopped first at the City Cafe for a coke and a little chat with the waitress. After finishing the coke, I got back in the Ford and went to my first delivery stop. To my consternation, I found there were no groceries in the truck. I hurried back to the store to report the theft.

There were several neighboring businessmen standing around the cash register with Mr. Burns when I returned. I did not stop to think that this was rather unusual for that time of day. The other men's being there made the situation more embarrassing, but, due to the seriousness of the loss involved, I blurted out the story to the boss on the spot, being very upset and almost in tears.

He told me quite sarcastically that if I rushed around the store like I rushed when I drove the delivery truck, he would be very proud of me. He then informed me that when I left the store, I had started off so fast that I ran the Model T out from under the entire load of groceries.—*James M. Bellah, Albuquerque, N. M.*

MY DAD had a trick steering wheel on his Model T Ford sedan, which I was warned to lock whenever I parked it. Locking separated the wheel from the steering column. Once, when I was 14, I drove this Model T out into the country looking for a place to fish. I parked on the shoulder of a narrow dirt road and climbed the fence to inspect a stream in the pasture. It looked unpromising, so I decided to drive on. I started out carefully but I had forgotten to unlock the steering wheel. The sedan rolled helplessly into a barbed-wire fence along the road and wedged a door handle tightly under one of the wires.

I reached under the back seat and pulled out a pair of wire cutters. At the same instant, an angry farmer appeared from nowhere. He wouldn't let me cut his fence. In fact, he didn't care for any of my juvenile ideas, me or my Ford. Not knowing what else to do, I unlocked the steering wheel, started the motor and tried to move. The barbs on the fence allowed me to move a total of four inches in either direction and sawed into the shiny black enamel. It was hopeless. I had to think of some way out if ever I wanted to drive Dad's Model T again.

I dug around in the tools and took out the jack. My farmer friend watched me. Carefully I put the jack between the taut barbed wires, pumped the lever and pried the fence free from the door handle. It was easy now. I got in, jammed my foot on the center (reverse) pedal and roared backwards—out of control. In

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my haste to get away, I wedged my foot in the center of the famous pedal trio, under the low and brake pedals. I stalled when I hit the fence on the opposite side of the road. Silently my farmer pal removed the jack from his barbed-wire fence and tossed it over to me.

"Jones won't let you cut his fence, either," he called.—*Harold S. Zimmermann, Whittier, Calif.*

MY STORY about the Model T goes back thirty-five years, to the spring of 1918, when I was experiencing my first year as a garage mechanic in a Ford agency and shop.

I was overhauling the differential assembly on a 1913 T one night and my lack of experience caused me to slap that axle in with the ring gear against the right-hand side of the housing.

When the driver and his family came in for the car, I climbed under the wheel, took careful aim through the rather narrow doorway behind me, and as I jammed down on the reverse pedal, the thing took off—yeah, forwards. Straight into a group of oil barrels, it dove, tipping one of them over—the full one without any bungs in it. Was my face red! This family had to entertain themselves while I turned that Model T axle around.

Later, when the big shots of our little hamlet decided to put on their annual grain festival celebration, they promoted an auto race, to be driven in reverse, on the full length of Main Street (about three blocks). An auto race at that time meant, of course, a Ford race.

Remembering my previous reverse experience, I got busy and turned my Model T axle around—deliberately, this time.

On the day of the locally famous race, I unobtrusively slipped up to the starting line, forward on the reverse pedal, thoroughly enjoying in advance the surprise and chagrin of my fellow race drivers when I threw my reversed Ford into high gear and hit that finish line in no time.

However, it did not work out that way. I had failed to take into consideration the eccentricities of my Ford. For the first block of the race, I did lead the procession. Then I hit the intersection, which consisted of a sharp raise for the crosswalk. My speed was too fast to control the jackknife tendencies of my Ford, and I suddenly veered off into the street at right angles to the course. By the time I got squared around to re-enter the race, the tortoises of this race (my original idea) were leaving me no room to safely do so, and they plodded on to the finish with me bringing up the rear.—*C. G. Leite, Minot, N. D.*

ALTHOUGH it occurred 26 years ago, I'll never forget my most amusing experience with a Model T Ford. I was eight years old and taking a ride with my aunt and uncle along Route 9W, atop the Palisades in New Jersey.

It came time to go home, and we started to descend the long, steep and winding road to the Dyckman Street ferry toll booth at the foot of the cliff. Halfway down, the brakes started to give way. My uncle kept the car under control, and as we neared the toll booth my aunt leaned far out of the window, waving a dollar bill. As we passed the booth, she shouted, "We'll be right back." Just ahead of the ferry entrance was a crude traffic circle. We coasted around three or four times and finally came to a stop in front of the booth. By this time a considerable number of spectators had gathered to stare aghast at a car apparently going aimlessly in circles with a woman waving a dollar bill out the window.—*Raymond Smart, New York City.*

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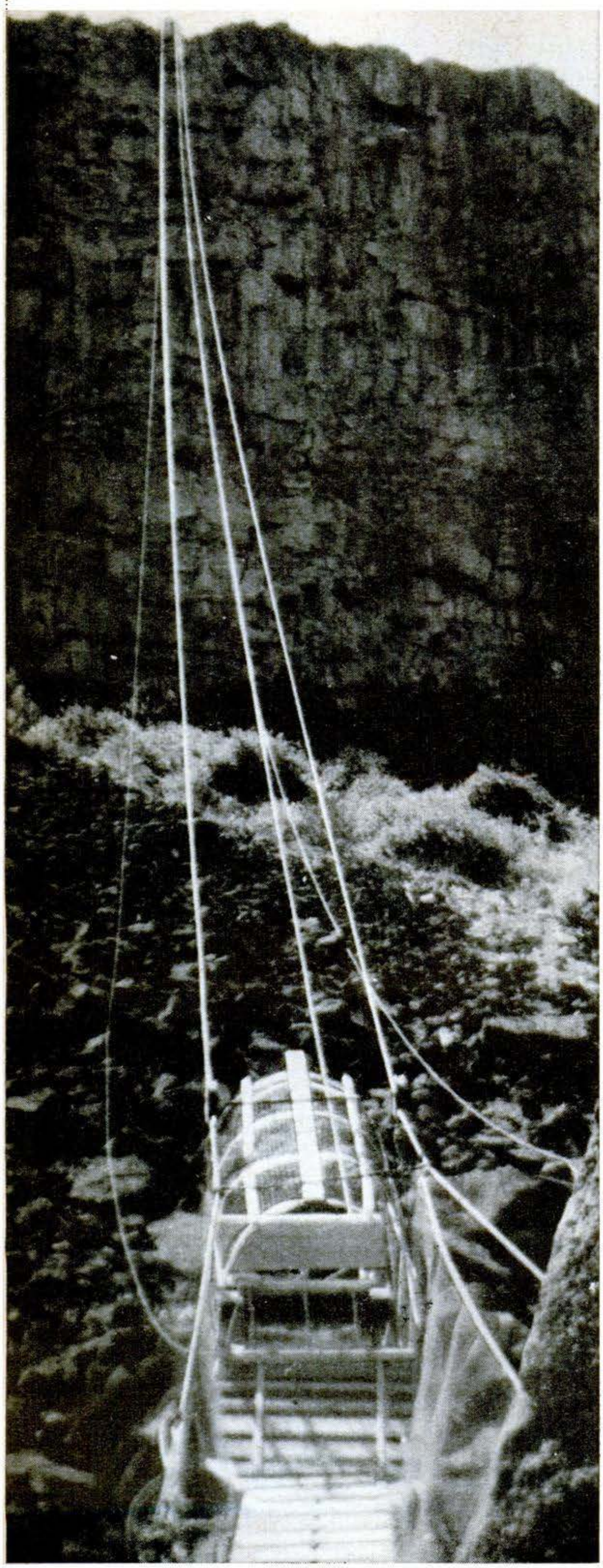

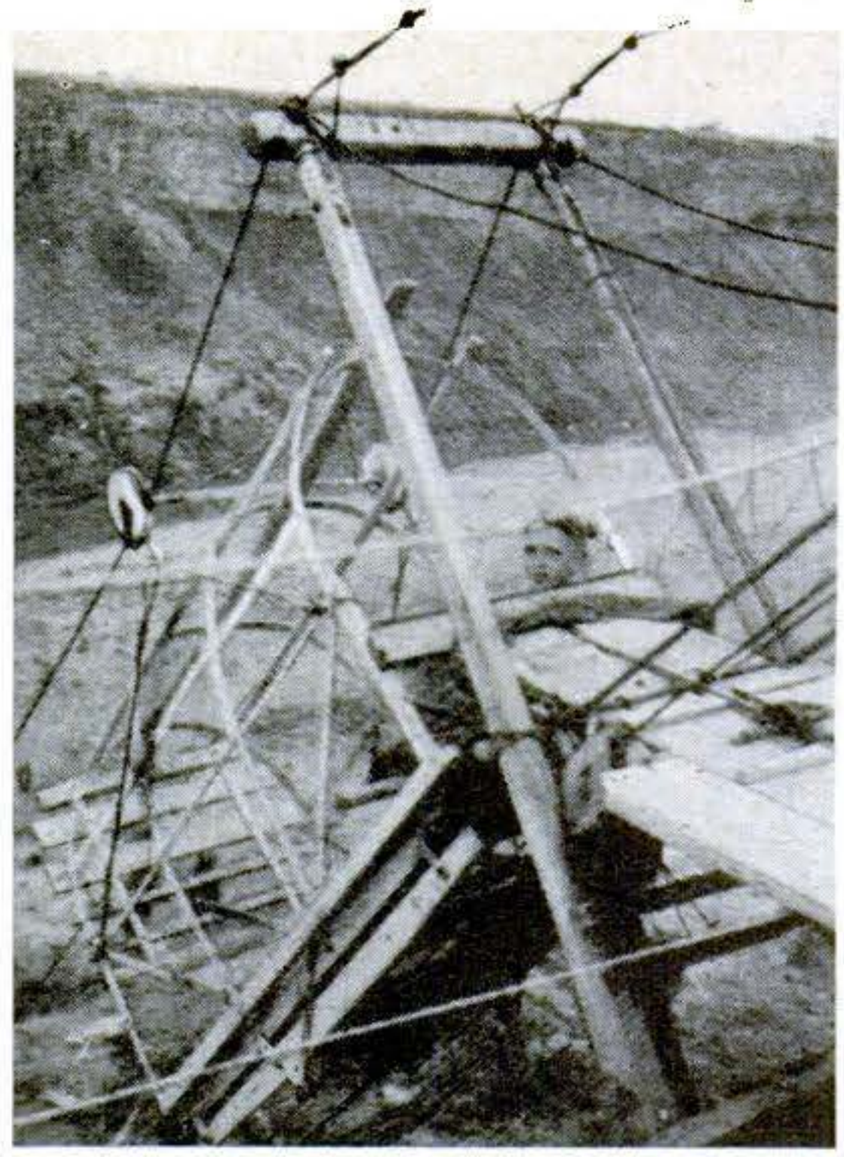

Family Rides Own Cable Car

IT TAKES nerve to ride this cable car from a river bottom to the top of a 400-foot-high bluff. But Albert C. Urie and his family ride it daily —whenever they leave their home at the bottom of a canyon near Filer, Idaho. Urie used 3,500 feet of cable to build the hanging road. To haul the car to the top, the cable is hitched to a jeep which then backs up 500 feet on the canyon floor. The car makes the descent on its own in less than 60 seconds.

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Bomb Bay Spins Open

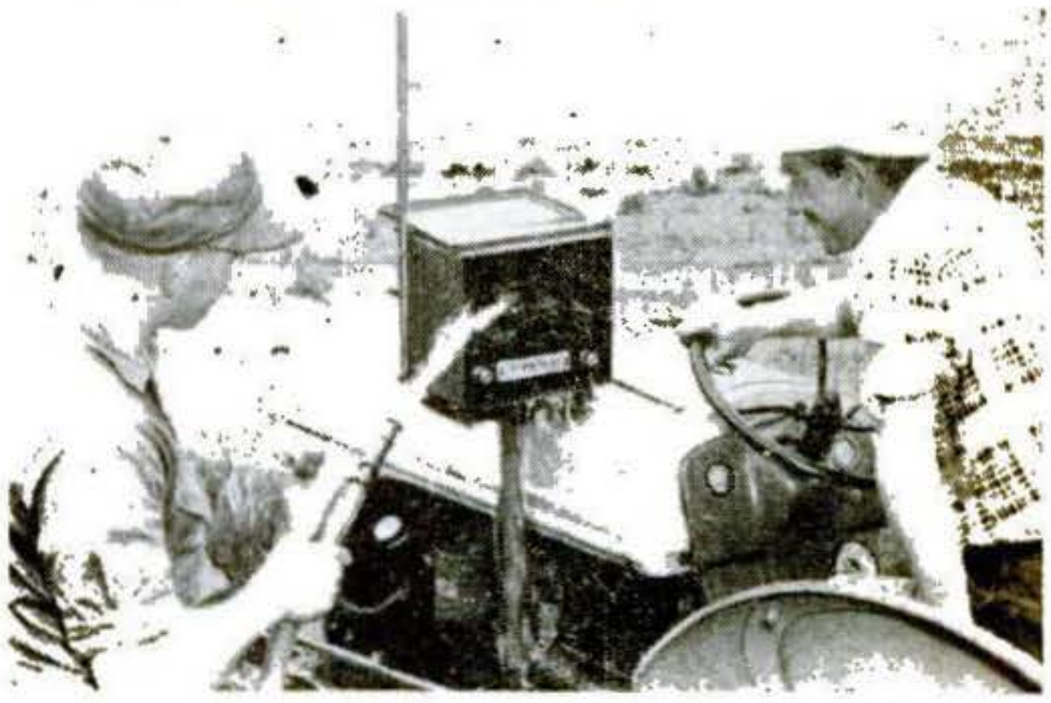
A NEW revolving door on the bomb bay is expected to allow 600-m.p.h. Air Force bombers to fly at full speed during bombing runs. The present door drops open, leaving a gaping hole—and the plane must slow down or risk being buffeted by air gusts which may bounce the bombs out of their racks. The new door leaves no opening in the fuselage except for a few seconds while it is being rotated.

A curved shell, it can be loaded apart from the plane, fitted quickly into place with the bombs inside the belly. At the target, the door spins over rapidly so that the bombs are outside, ready to be dropped (above). To keep the bombs from "tumbling" as they fall, a frequent mishap in high-speed drops, the door is fitted with two air-actuated plungers that kick each bomb off in its normal dropping position. The new bomb-bay door was developed by the Glenn L. Martin Co.

LOADED WITH BOMBS above, the new rotary door can carry rockets, too.

Sturdy Tractor Radio Lets Farmer Listen as He Rides

EVEN a stream of water in the puss can't faze this new tractor radio, says Firestone. The extra-fine wire mesh covering the grille is flocked so that it is dustproof and waterproof to withstand outdoor life on a farm. A rubber-cushion mounting system, similar to that used for delicate instruments on aircraft, helps the eight-tube set withstand shocks and jolts. The radio is specially ventilated to permit the free flow of air while keeping out dust. The cone speaker is impervious to dampness.



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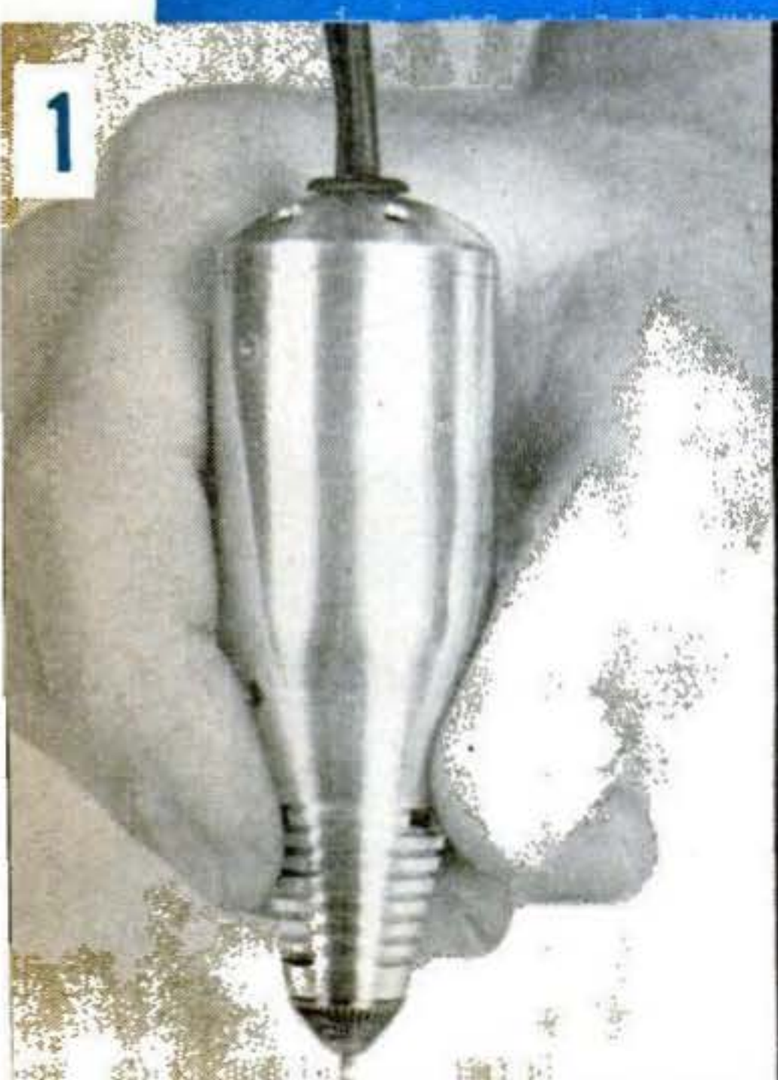
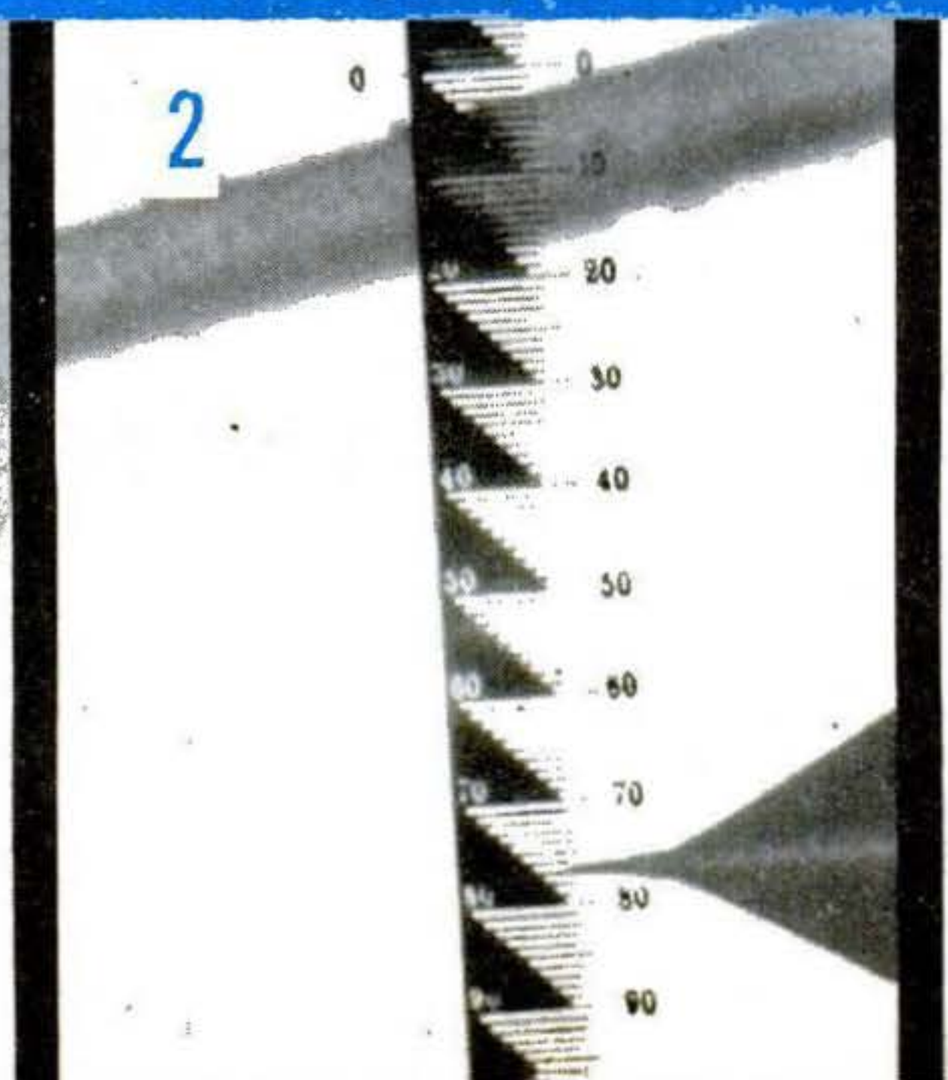
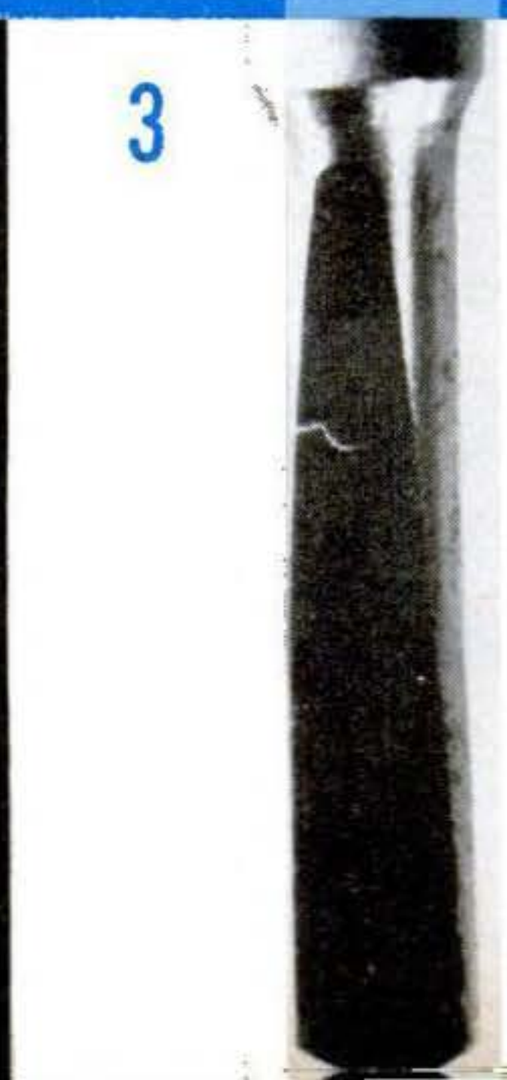
This man is using the







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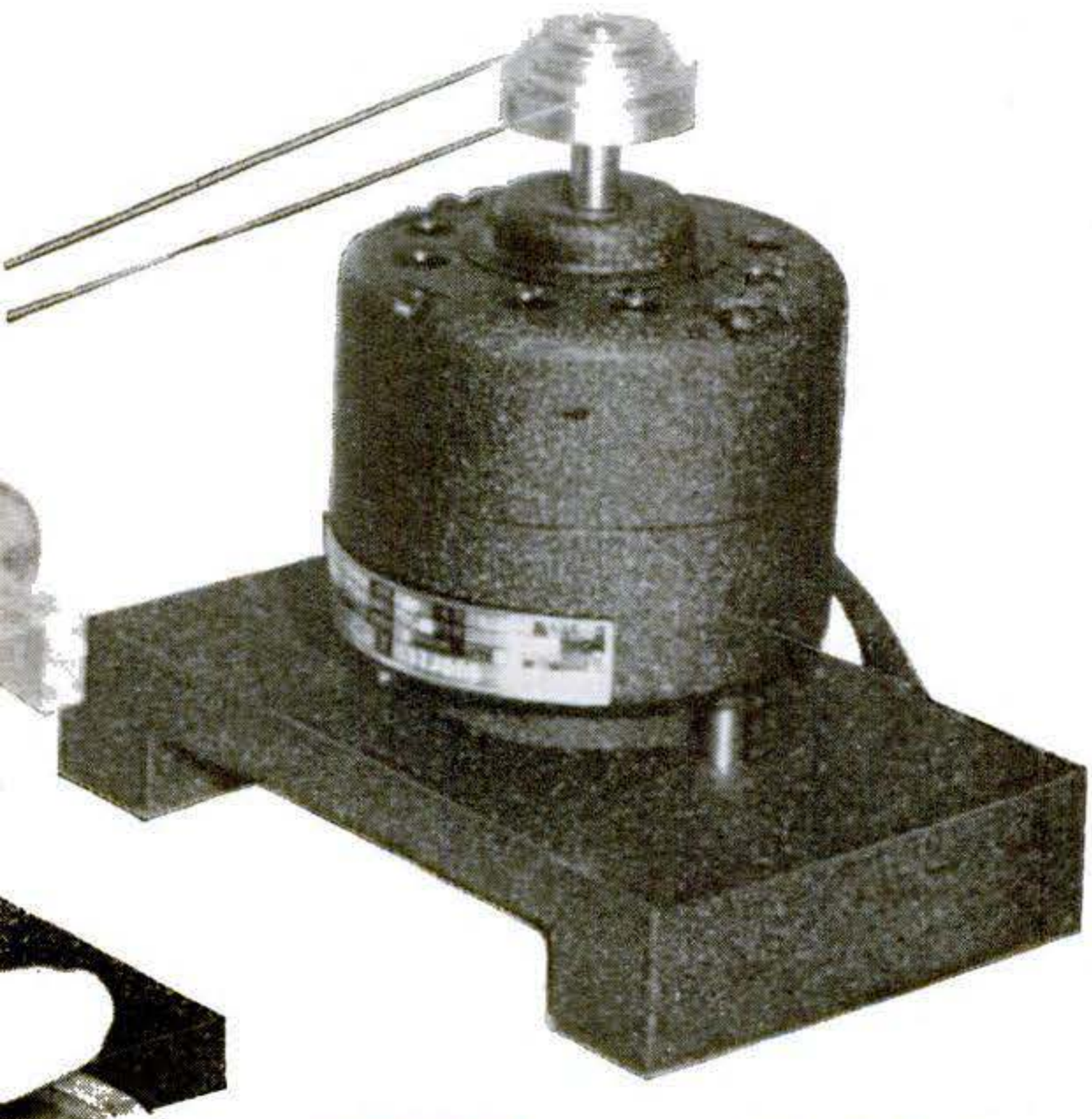
World's Smallest Drills

John Cupler started making drills 1/20 the diameter of a human hair because nobody else could.

By John F. Stearns



MICRODRILL, supported in V blocks, is studied by operator under 18-power magnification. Belt of fishing line spins the drill.

1 TINY CUPLER DRILL for use in hand tool is pictured in first panel at left. 2 Big, barlike shadow in microphotograph is a human hair. Compare it with size of drill tip below it. Tip must be given flats and points before it is complete. 3 This is an enlarged view of pivot-type drill, the only kind the factory turns out. Twist drills, with spiral flutings, are useless for microscopic boring because they cannot stand the torque. Biggest standard drill Cupler makes is 125/1,000 inch. Extreme simplicity of company's drilling mechanism permits even novices to bore holes of 1/1,000 inch to very close tolerances.

JOHN CUPLER is a pleasant guy who figures there is nothing unusual about carving the Lord's Prayer on the head of a pin. You see, Cupler makes metal drills 1/20 as thick as a human hair.

His drills are the world's smallest. They're also the fastest. He has turned them as high as 500,000 revolutions a minute, but for everyday use he contents himself with a little over 400,000 revs.

Cupler has built a big business out of smallness. The holes in his jet nozzles for diesel fuel-injection systems have to be tiny to vaporize the fuel. His spinnerettes for making synthetic thread are flat disks pierced with microscopic holes through which flow the gossamers of nylon, Orlon and Dacron. His drills bore those holes in the works of wrist watches that have to be looked at through a jeweler's eyepiece.

For years diesel-engine manufacturers had been using nozzles like those on garden hoses. They atomized the fuel by shooting it through a big hole containing a centered diffuser shaft. It wasn't efficient, but the thing was easy to make. Cupler, born with an income-tax man's passion for exactness, was outraged.

He was pretty sure—in fact, he knew—he could drill precise, microscopic holes in diesel nozzles. A few years before, he had quit law school to go to work for a rayon manufacturer. There he had learned how to make drills 5/1,000 of an inch in diameter for spinnerettes.

The drills were turned out with agoniz-

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ing slowness. Worse, only a tiny percentage of them worked at all, and the few that did wore out or broke at a tender age.

Cupler had done preliminary research in a home laboratory and workshop—his own bedroom—in Cumberland, Md.

General Motors, seeking better diesel nozzles, was one of his first customers. Cupler took on the drilling job. His workshop, by then, had overflowed into the basement and seeped into the garage. He called it the National Jet Co.

Holes Are Too Tiny

He did the job all right. He did it too well. The holes were too small. They got plugged up during further processing at assembly plants. So GM asked him to make drills for their own use.

Cupler chuckles when he recalls it.

"They wanted 60 gross of drills to start with," he says. "My grandfather, who was backing me, and I couldn't calculate an asking price, any more than we could imagine making that many drills.

"We finally suggested eight cents apiece. The GM people just laughed. They offered 70 cents apiece to start, and later raised that."

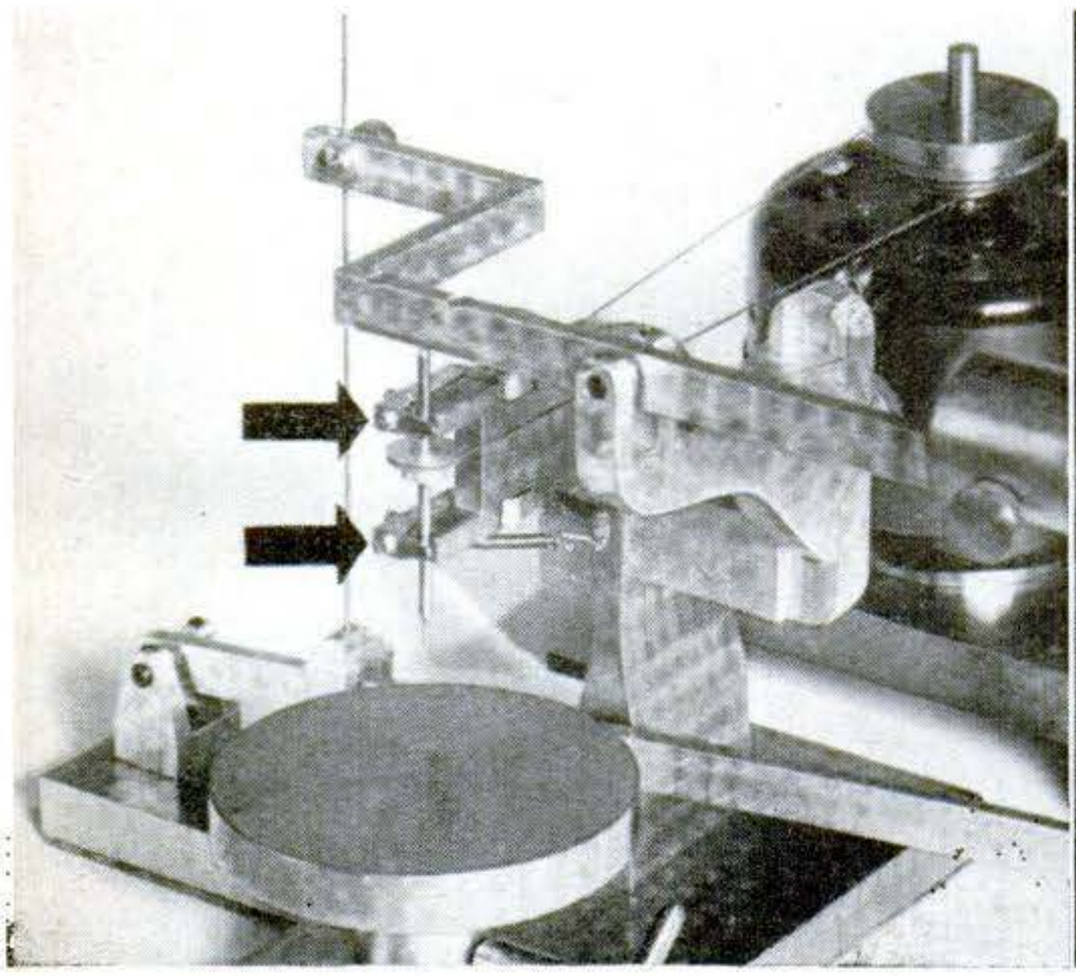
GM then took the next step, asking Cupler to go to Detroit and help design machines that could take full advantage of his precision drills. He did. One of his earliest patents is for the complex machine he designed, with GM engineers, to put multiple holes in diesel nozzles automatically.

But the high-precision microdrilling wasn't precise enough for Cupler. As his business grew and he moved into a two-story factory in downtown Cumberland plus a structure next door, he chafed at the faults in his own machines.

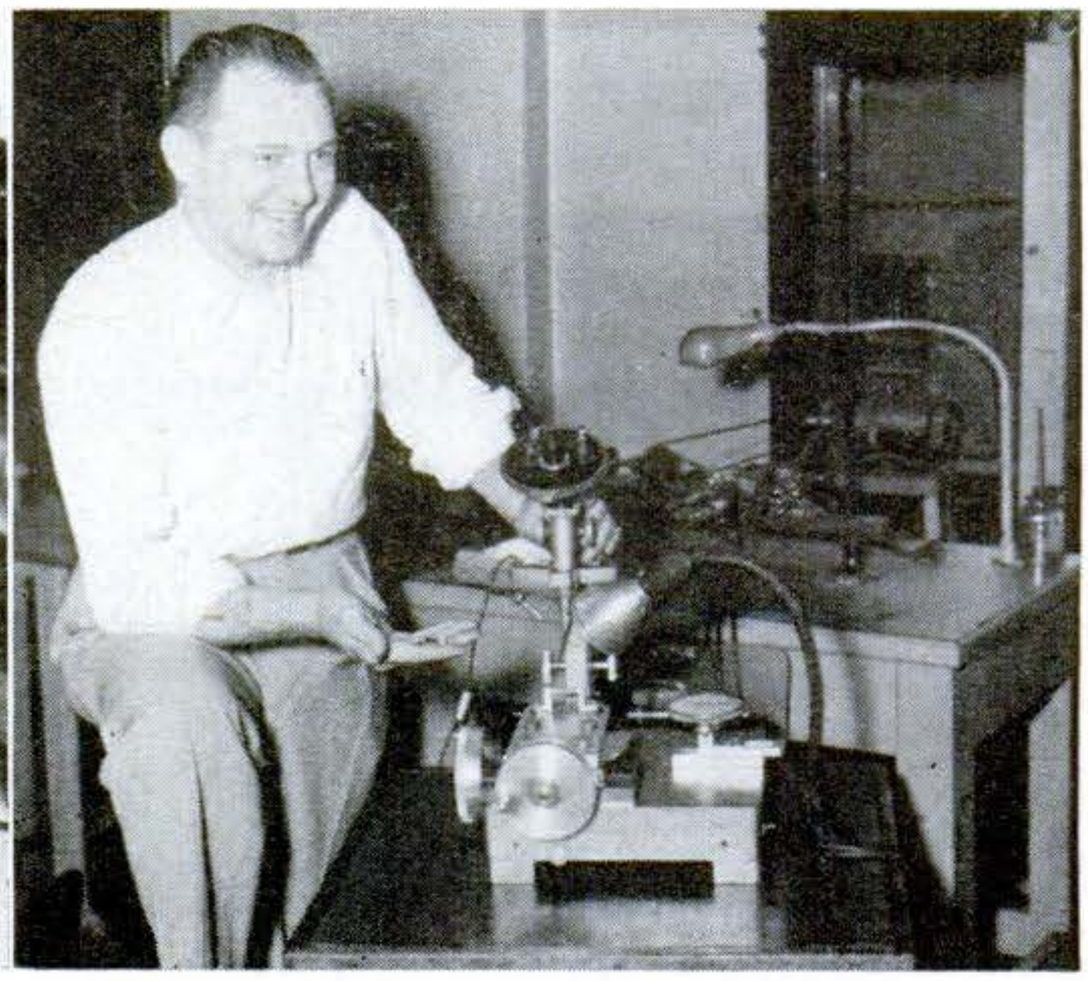
"There's no such thing as a perfect mechanical chuck," is one of his sayings. Yet he had to depend on mechanical chucks to grip drills during their manufacture and to hold them while they did their work. Any tiny inaccuracy in a chuck is transmitted to the drill, and inaccuracies can get tremendous when a drill is 1/1,000 of an inch in diameter—or less. Cupler's smallest drill, today, measures 25/100,000. That's one-tenth as thick as one page of this magazine.

Even with near-perfect chucks, Cupler had to go to fantastic lengths to insure precision. One protective device was a refrigerated oil-cooling system to lessen thermal "creep"—distention of metal parts by heat. So cooled, a drill press could be used for a couple of hours at a time before the accumulated frictional heat got excessive.

Cupler felt not only that he could do a better job of precision drilling but also



Vs IN JEWELED V-BLOCK drilling machine are indicated by arrows. Since shaft of drill is its own axle and axis, imperfections of a mechanical chuck are avoided.



CUPLER SHOWS one of his original tools—a microscope made from odds and ends at a cost of $200. It proved better than a $4,500 commercial microscope he couldn't afford.

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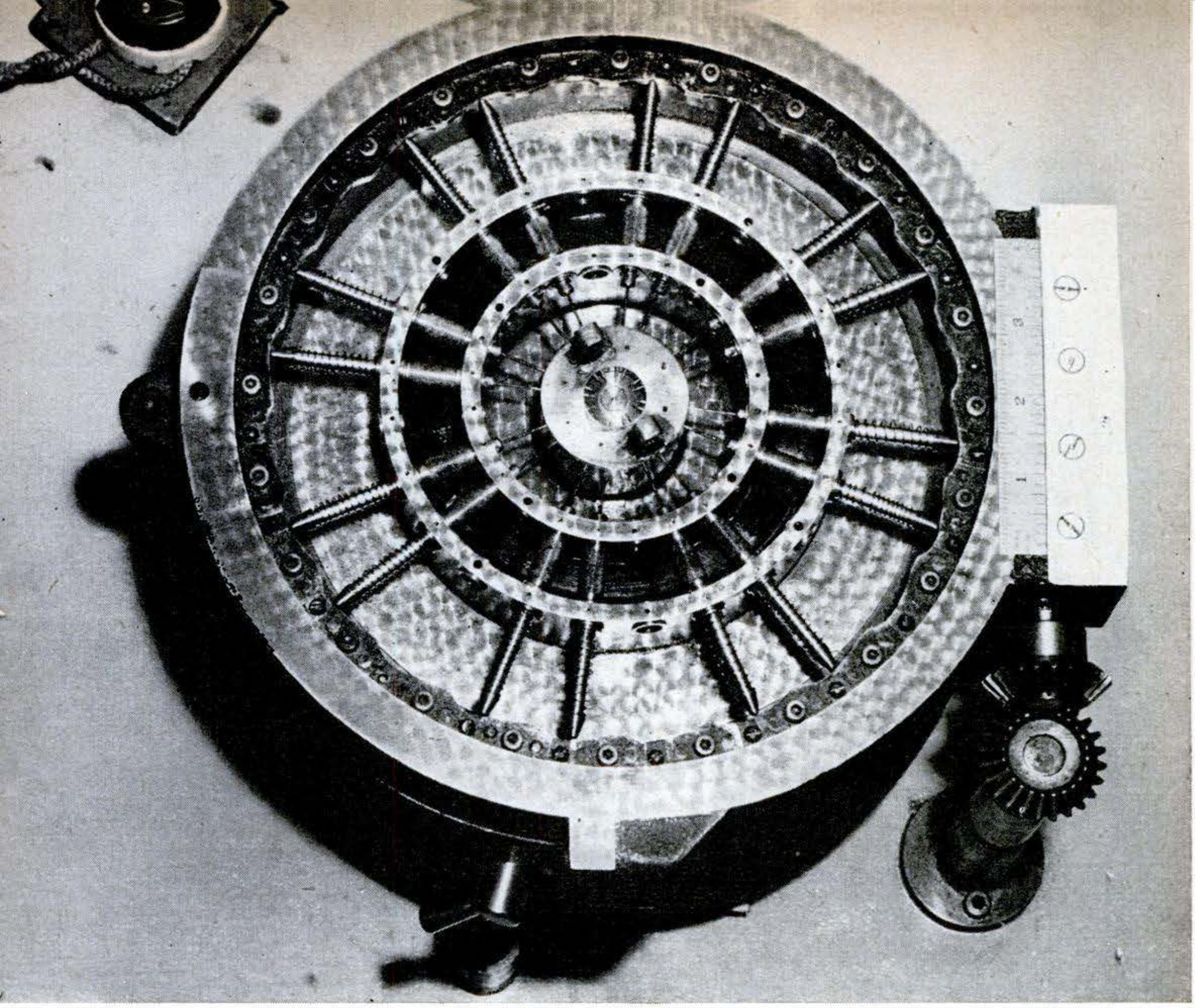

CUPLER'S RADIAL MULTIPLE DRILL will put up to 24 holes in a single workpiece (such as clock balance wheels) simultaneously. Drills are driven by friction motor and are spun by cams on ring just inside outer wall. Rig also uses V-block principle.

that he could build a microdrill that would run all day every day.

He did both. He thought of using a V block as a bearing to support his drills without a chuck. This permitted the making of drills that were truly concentric throughout, and gave him a drilling machine that worked to extremely minute tolerances.

Drill Is Its Own Axle

The V block is actually two V-shaped notches in a bearing block. To make a drill point, the two Vs support a steel shaft so that it rotates on its own circumference while being shaped and finished. In a drilling machine, the drill shaft fits into the Vs in the same way. Since the drill is always its own axle, so to speak, it can't be anything but true.

Vibration, another bugaboo of microdrilling, is banished by mounting the motor drive separately. The drive belt, a piece of fishing line, encircles a small pulley keyed onto the drill shaft between the two Vs. It transmits power, holds the drill shaft in the Vs and "floats" the drill above the workpiece, all at once.

Up to now, Swiss hand-craftsmen have had a practical monopoly on the manufacture of jewel bearings, a critical requirement of modern technology. But Cupler has recently designed an ultra-high-speed machine which he regards as the key to their mass production. It whirls a tiny drill, at speeds up to 411,000 r.p.m., to put holes in jewel bearings for watches, scientific instruments and the like.

With the drill point spinning in a diamond-dust compound, it grinds through a tiny, crystal-hard gem in about half a minute. END

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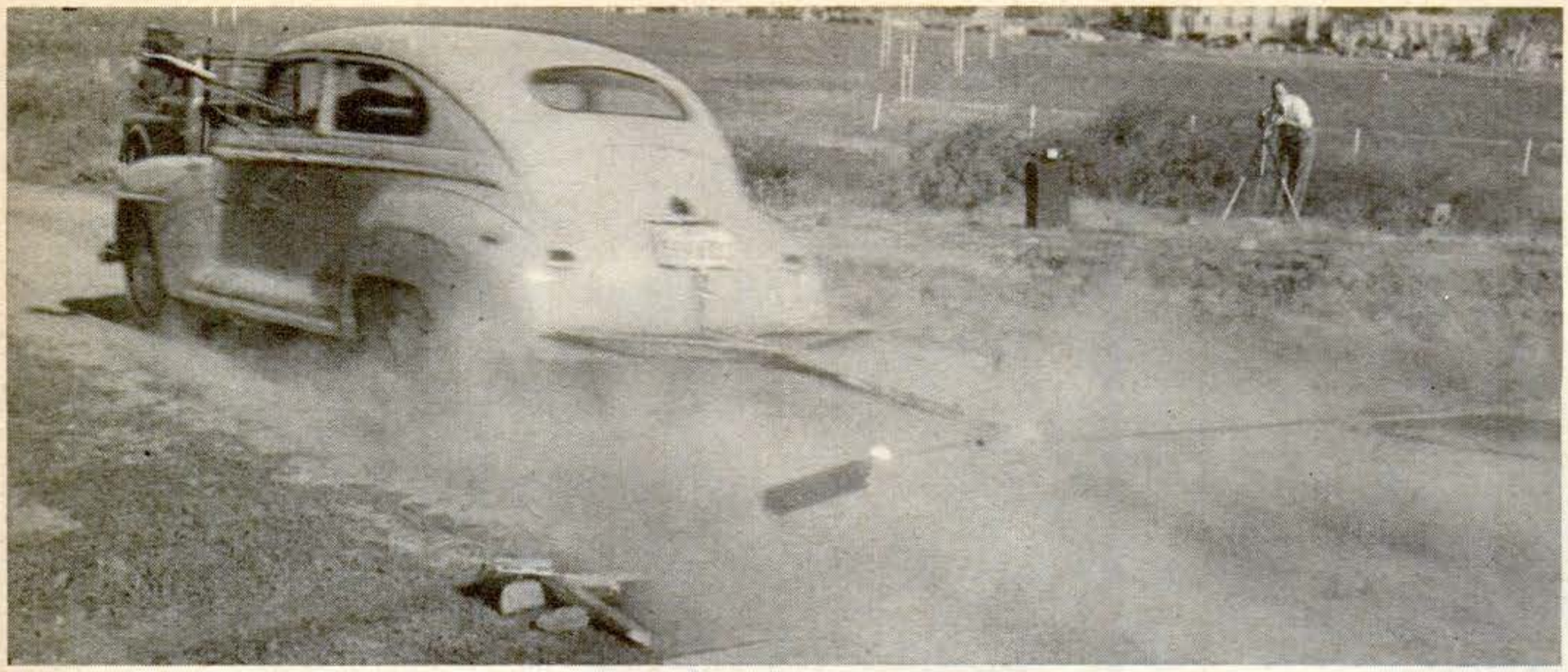

Drivers Test Crash Belts Without Crashing into Anything

1 **The car above has just "crashed"** at 25 m.p.h.—without hitting anything. The gimmick was worked out at the University of California at Los Angeles to see how much safety there is in a safety belt. As the car took off, an aircraft hook on the rear snagged a cable stretched across the road. Concrete blocks—two at each end of the cable, each weighing a ton—gave ground, sliding two or three feet. Then the cable snapped the car to a stop.

2 **The car shuddered to a halt** in 36 feet with a G-force of 3.4—enough to conk your head on the windshield or the dash, or to swing open an unsafe door and jolt you out.

3 **Safest for driver,** says UCLA, is chest belt with one end bolted to door to keep it shut on impact. Back-seat riders can use single lap belt. (Kids were not in car during test.)

More Light for Night Drivers

MORE than half the light from the mercury-vapor street lamp at right bathes the roadway. The reflector, designed by Westinghouse, angles two beams so they put 20 percent more light where it will do the most good. Refractors control side lighting.

▶▶▶Police now can nab speeders with pictures. A camera on a police car is lined up on a fixed object across the road. Two snaps of the passing car, taken 1/17 second apart, put the evidence on film. Sargent & Greenleaf, Inc., makes the traffic camera.

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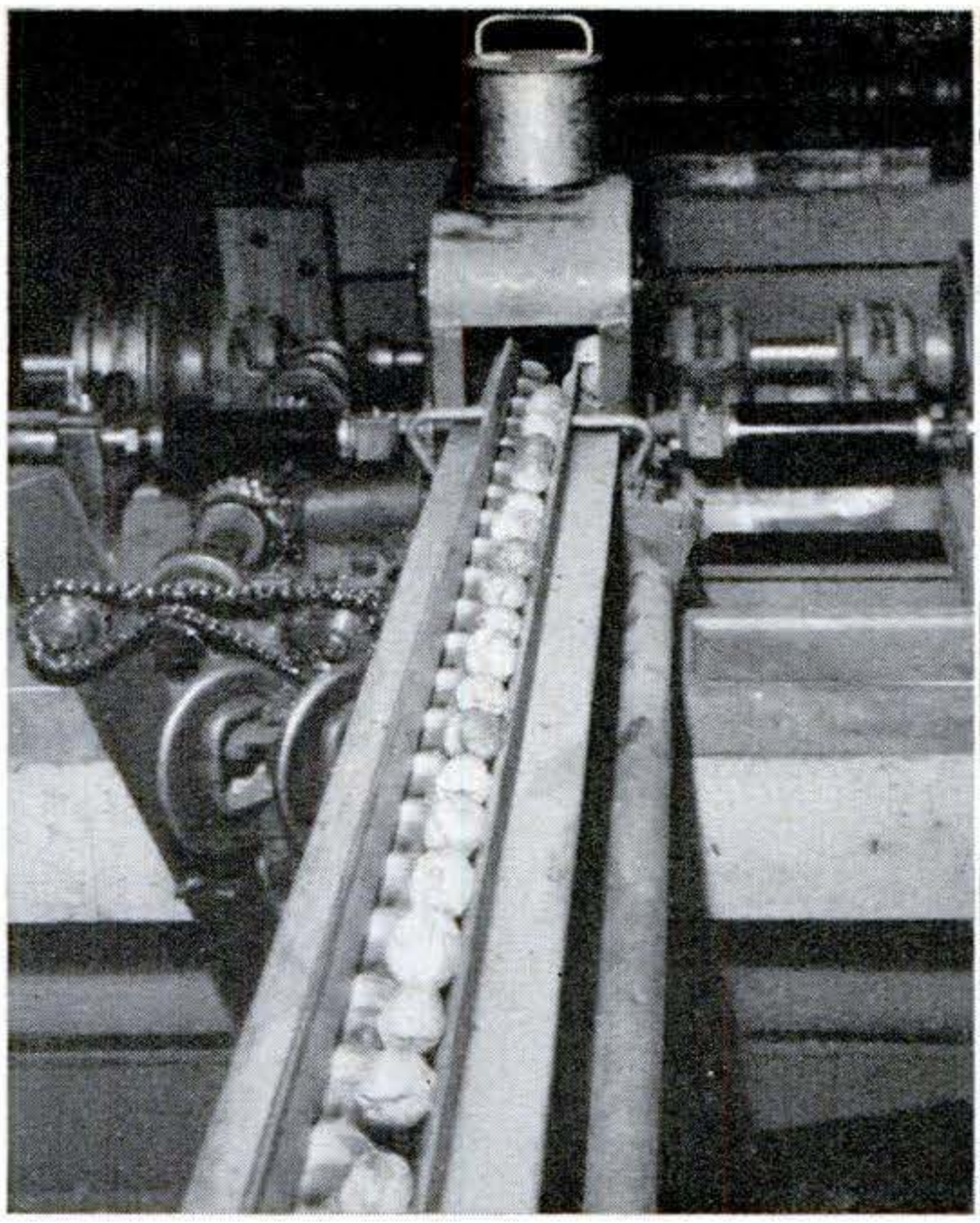
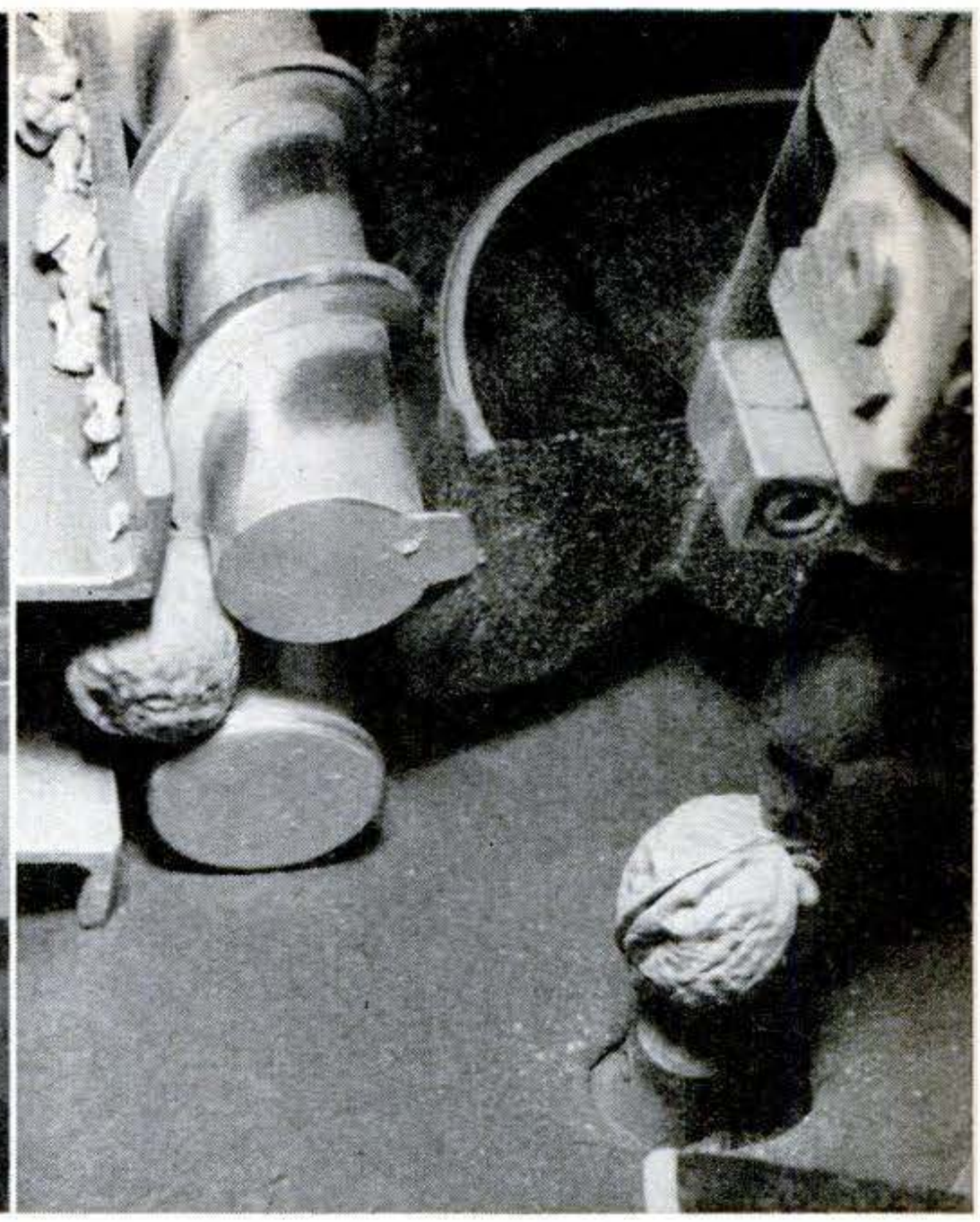


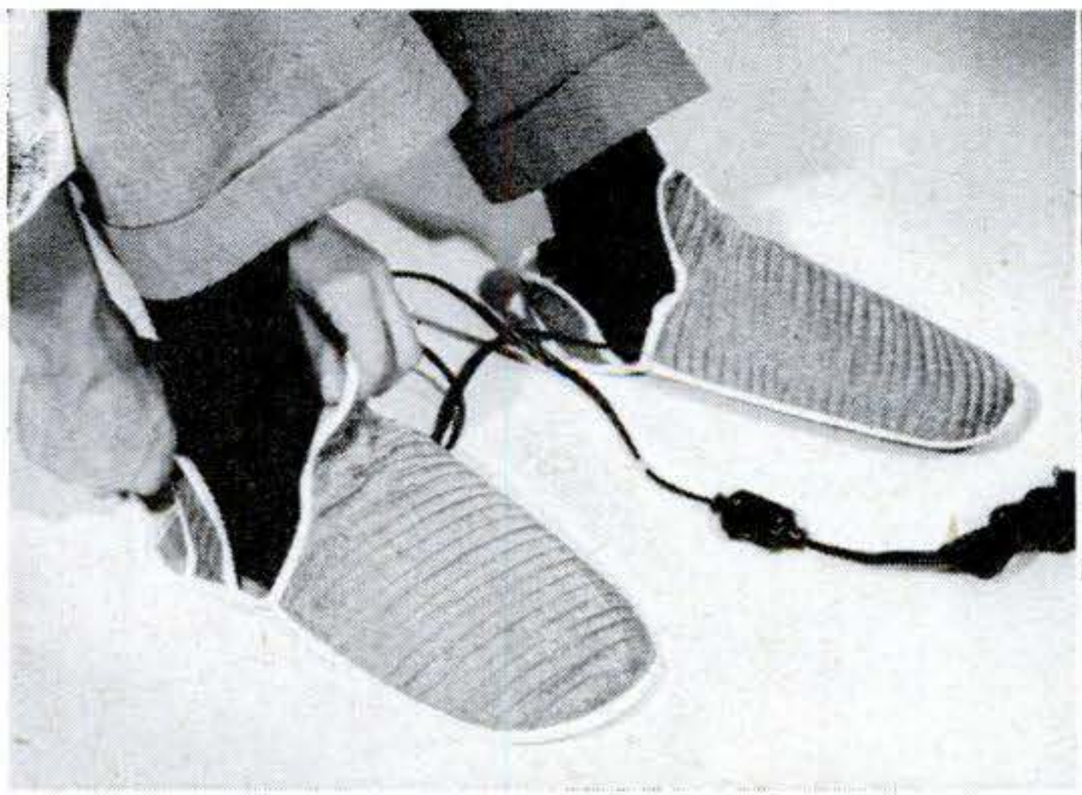


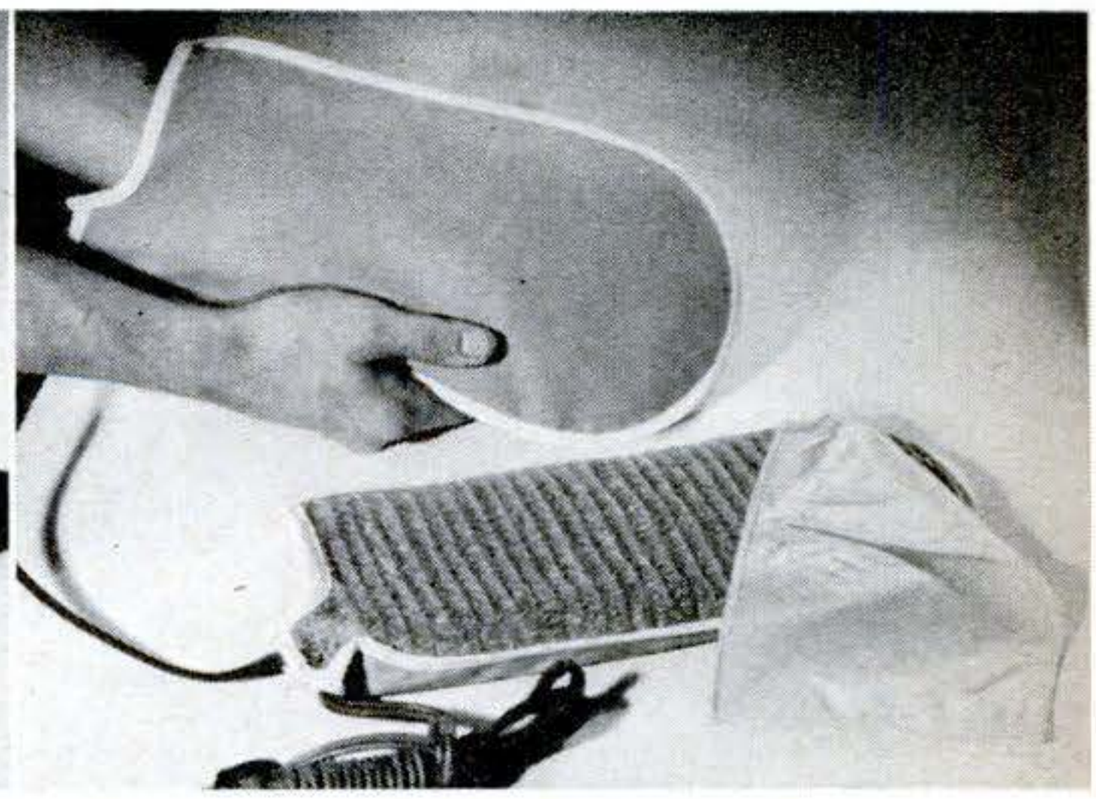
Man-Made Lightning Bolt Harnessed to a Job—Cracking Walnuts

NUT packers have found that a 65,000-volt, 5,000-ampere jolt of electricity will take the shell off a walnut clean as a whistle. The kernels are undamaged, and production per worker is more than doubled.

The nuts are fed from 10,000-pound storage bins onto threaded rolls that carry them into a metal-shielded concrete building. This houses 18 cracking units (above left) in two banks of nine each. Dropping one at a time from the rolls, the nuts are grasped by movable electrodes (above right) and held for an instant while the big bolt shatters the shells. Then meats and shells drop into an underground conveyor that carries them to be sorted and packed.

Because of the high voltage, the room shielding is carefully grounded and the discharged current is carried deep into the ground by heavy rods. The electronic cracker was developed by the Northwest Nut Growers, Portland, Oregon. Packers hope to design similar crackers for other nuts, such as almonds and filberts.





Slippers and Mitts Have Electric Heaters Built Right In

COLD feet after a day of skiing, hunting or outdoor work warm up fast when shoved into these electrically heated slippers (above left). They and the mitts (right) are also said to provide soothing heat for such ailments as arthritis. Both can be used in bed. Dimensional Products, 166 Second Ave., NYC, sells them.

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What Are You Passing Now?

YOU can name at a glance most of the cars you meet on the highway. But glimpsed from behind, as you swing out to pass them, they're not quite so easy to tick off. And trucks are even tougher. See how many you can recognize that way in the pictures on these pages. Identify the cars by make, the trucks by type. Then check with the answers printed upside down at the bottom.

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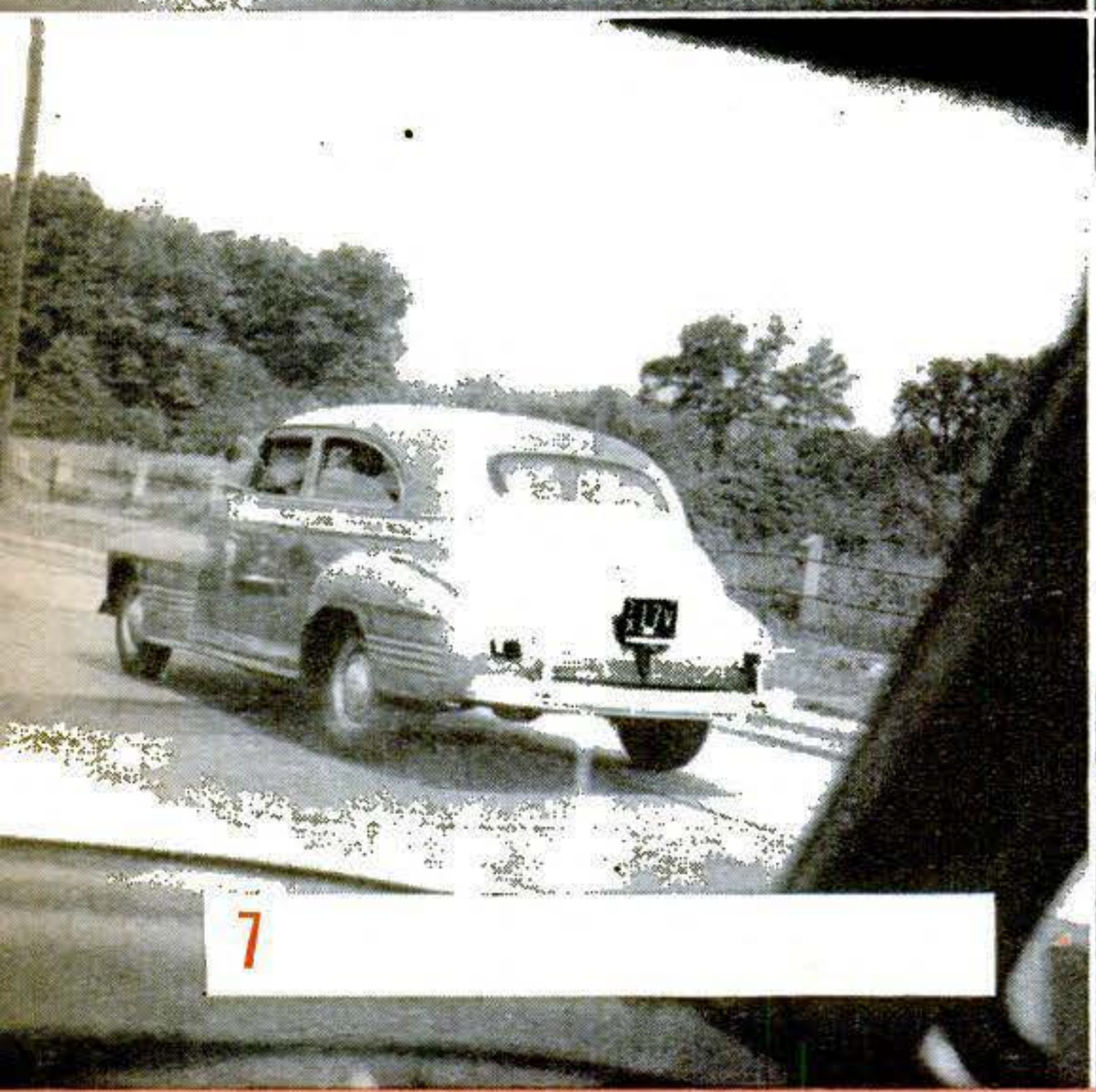

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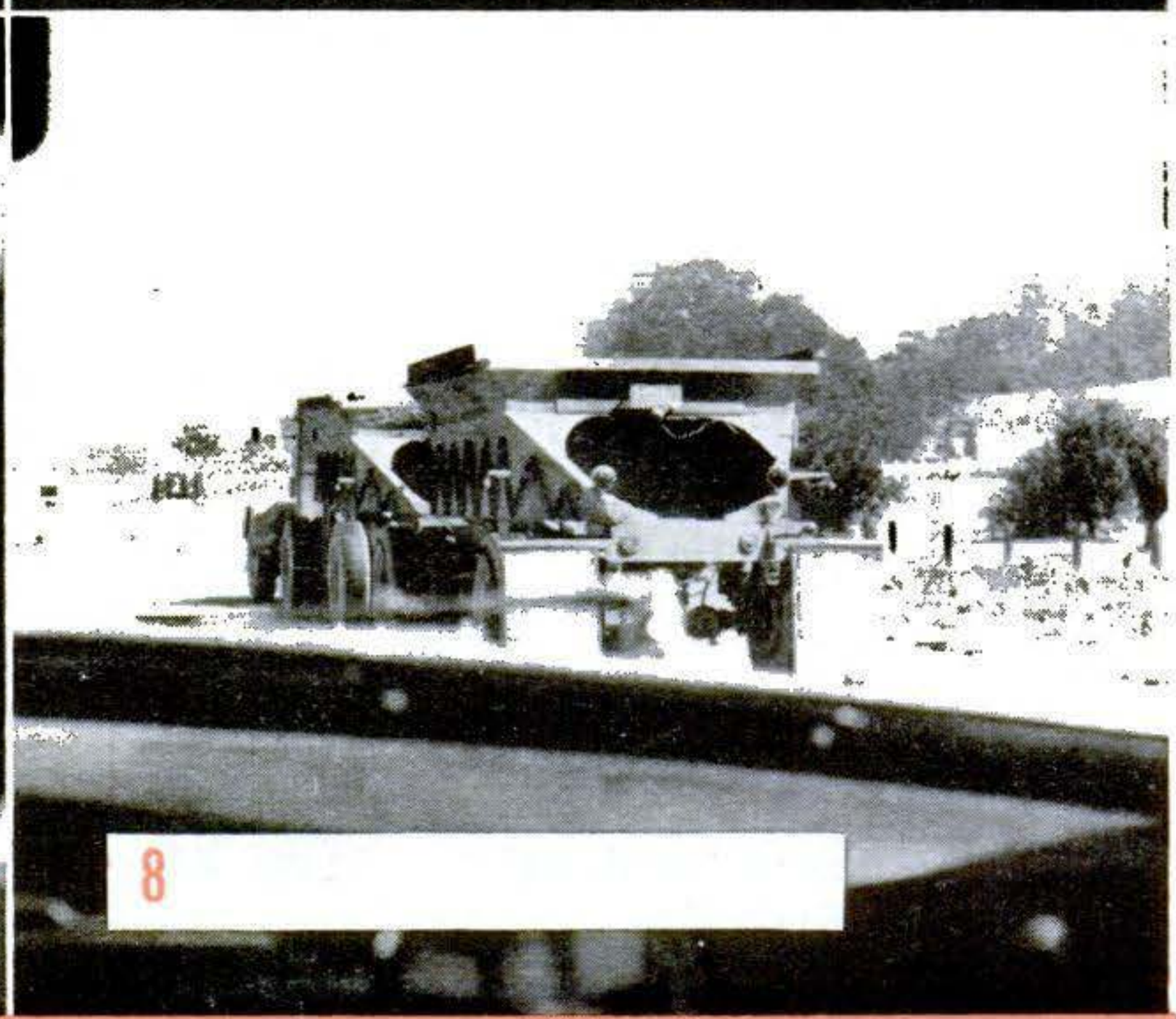

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trailer (hauling road roller); 6. Mercury; 7. Pontiac; 8. Truck and two gondola gravel-carrier trailers; 9. Plymouth; 10. Lumber truck and trailer.

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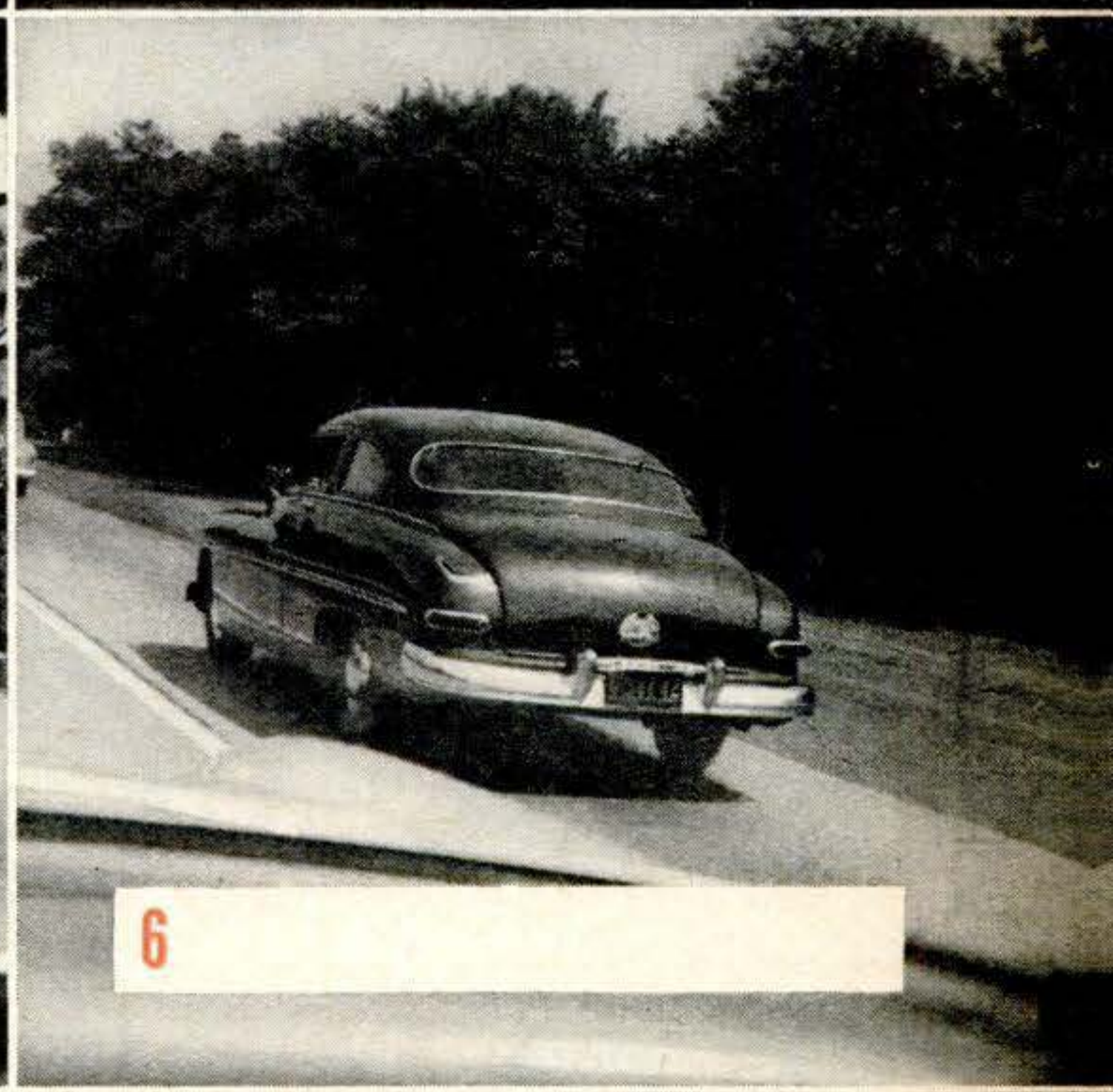

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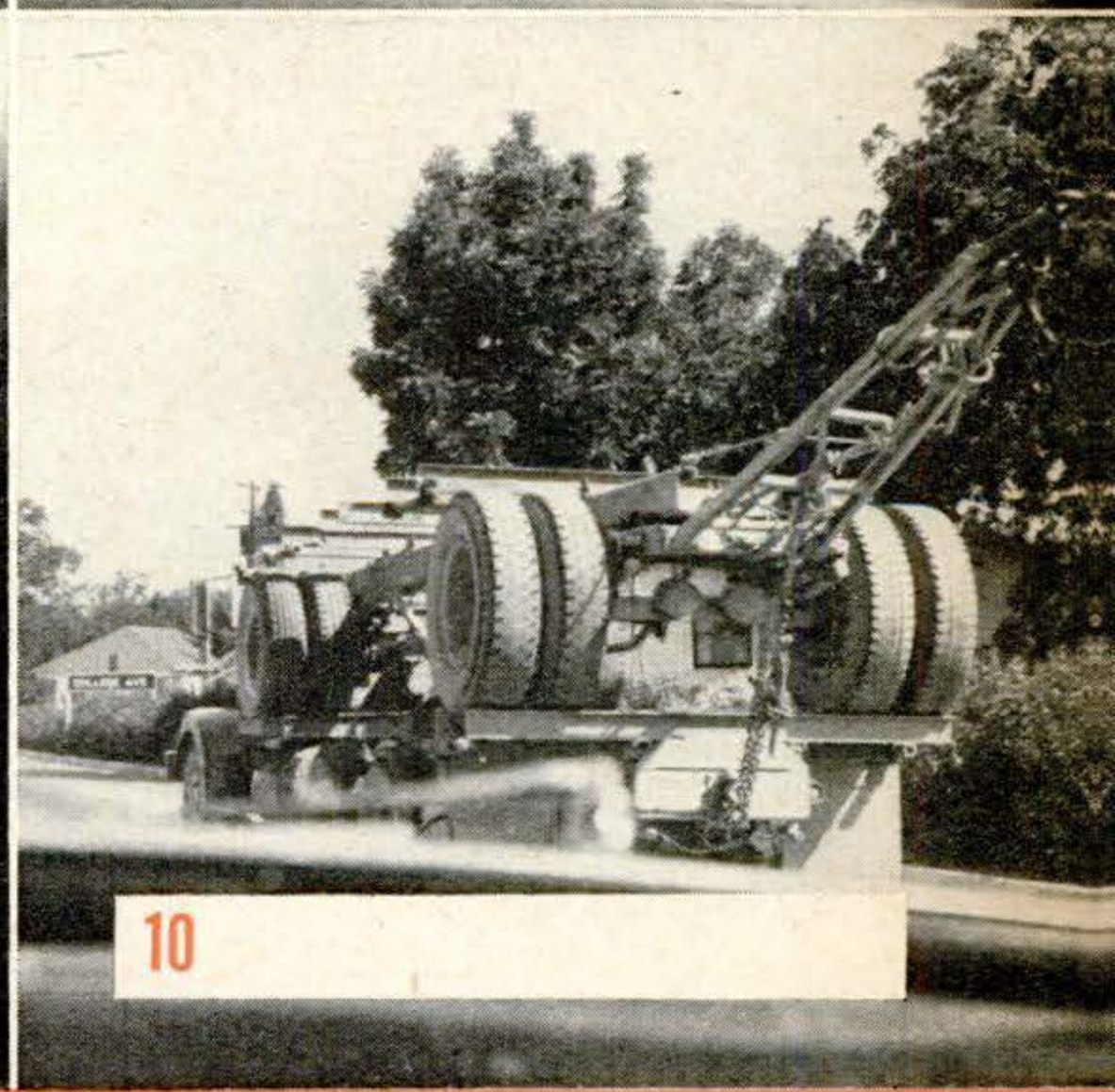

10

Answers: 1. Chrysler; 2. Truck and semi-trailer van; 3. Diesel tank truck and trailer (carries liquid butane); 4. Nash; 5. Tractor and "goosenecK"

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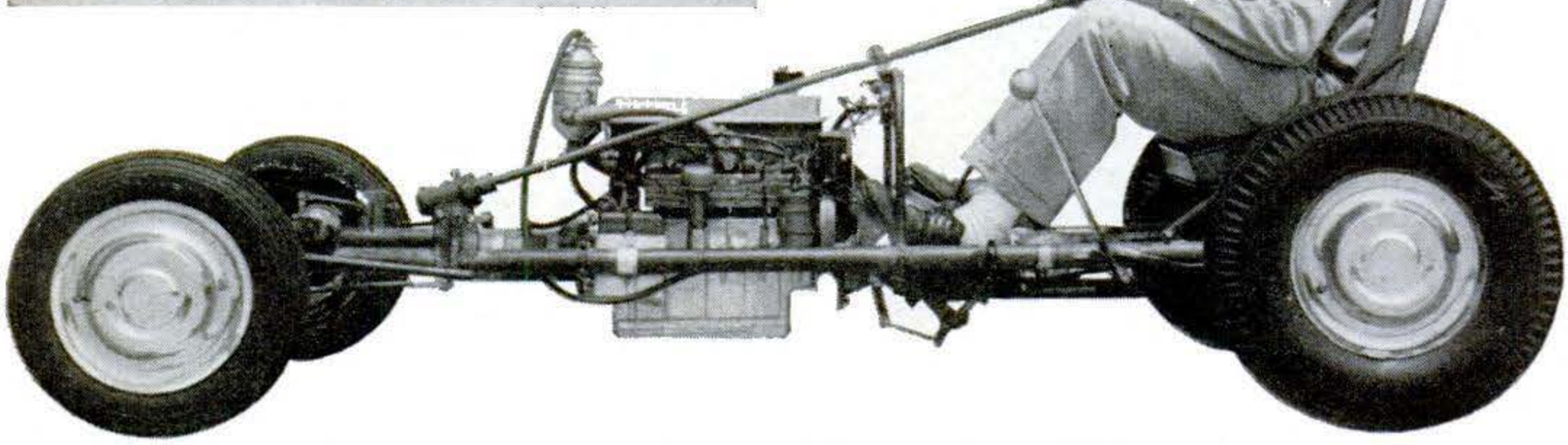


These Little Old Crosleys, They Ain't What They Used to Be

CROSLEYS may be the Orphan Annies of the auto world, but they still have some sugar daddies. Take for instance the two Crosleys, above, that Nick Brajevich of Los Angeles has lovingly rebuilt.

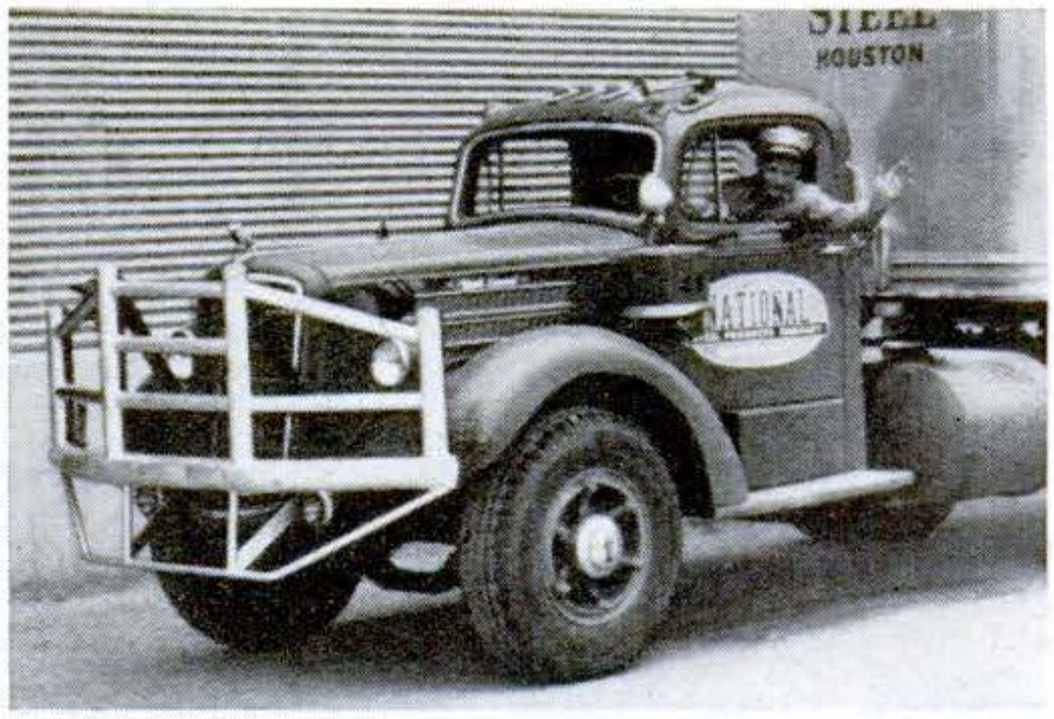
Brajevich is proudest of his little skeleton. A red-hot dragster, it's little more than a '50 Crosley engine mounted on two straight lengths of chrome-moly tubing. He has upped the displacement 3.52 inches by reboring the cylinders: the 2.25-inch stock crankshaft stroke remains the same. The breathing capacity has been improved by grinding and polishing the intake and exhaust ports and passages within the block. Alcohol, atomized by two carburetors, drives the engine 8,200 revolutions a minute.

Result? The baby has hit 97 m.p.h. on the quarter-mile drag strip at Santa Ana.

Brajevich's fancy sportster (above left) got its start in life as a '49 Crosley Hot Shot. Frenched headlights flank a grille of Nick's own design. The air scoop is from a '48 Merc. Cushioned seats have replaced the Crosley buckets and the flexible-steel steering wheel, taken from a midget, is wrapped in two-color plastic. The interior is maroon and cream.

Calling Dick Tracy . . .

HE'S not admiring his new wrist watch—he's making a radio broadcast. The disk strapped to his wrist is a complete transmitter. Sylvania built it to show what can be done with transistors, the tiny elements that do the work of radio tubes.



Git Along, Little Dogies!

DOWN in Texas they've had to put cowcatchers on trucks to keep stray steers from tangling with the radiator. The cowcatchers also help if the deer and the antelope do their playing too close to one of the Lone Star State's superhighways.

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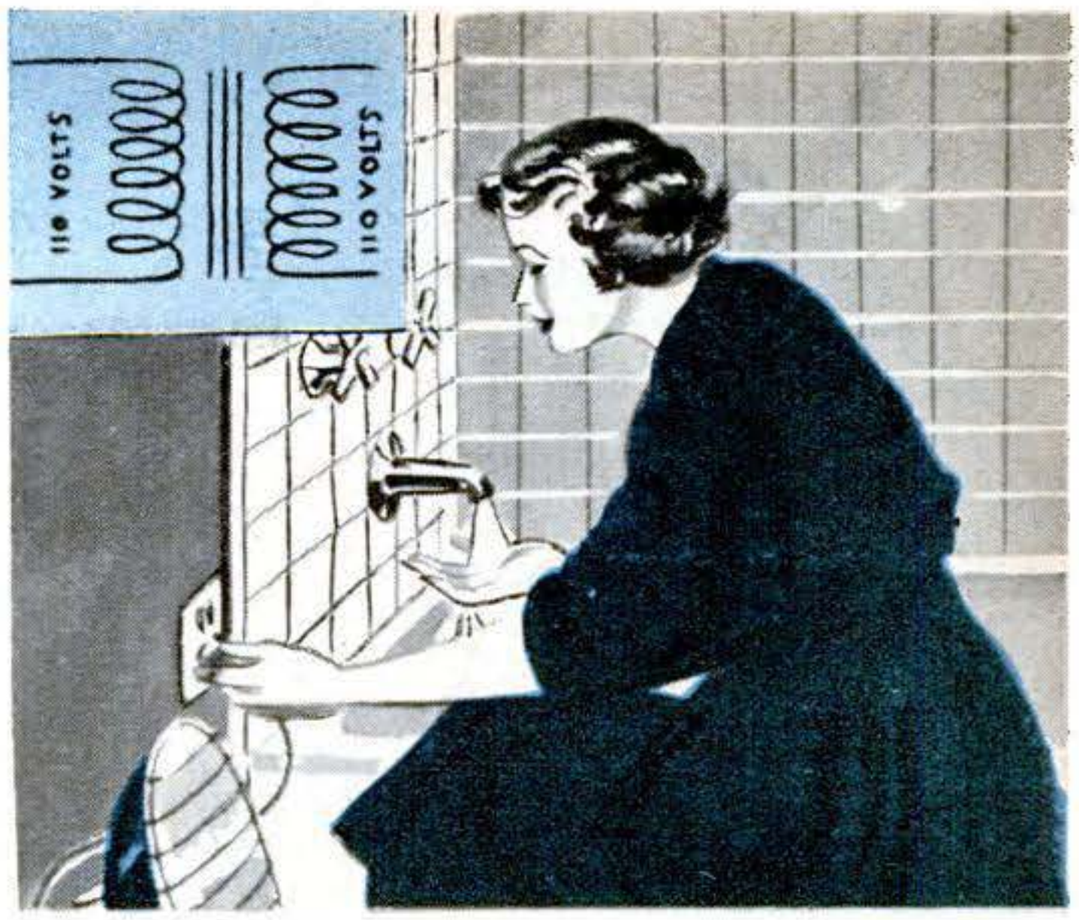
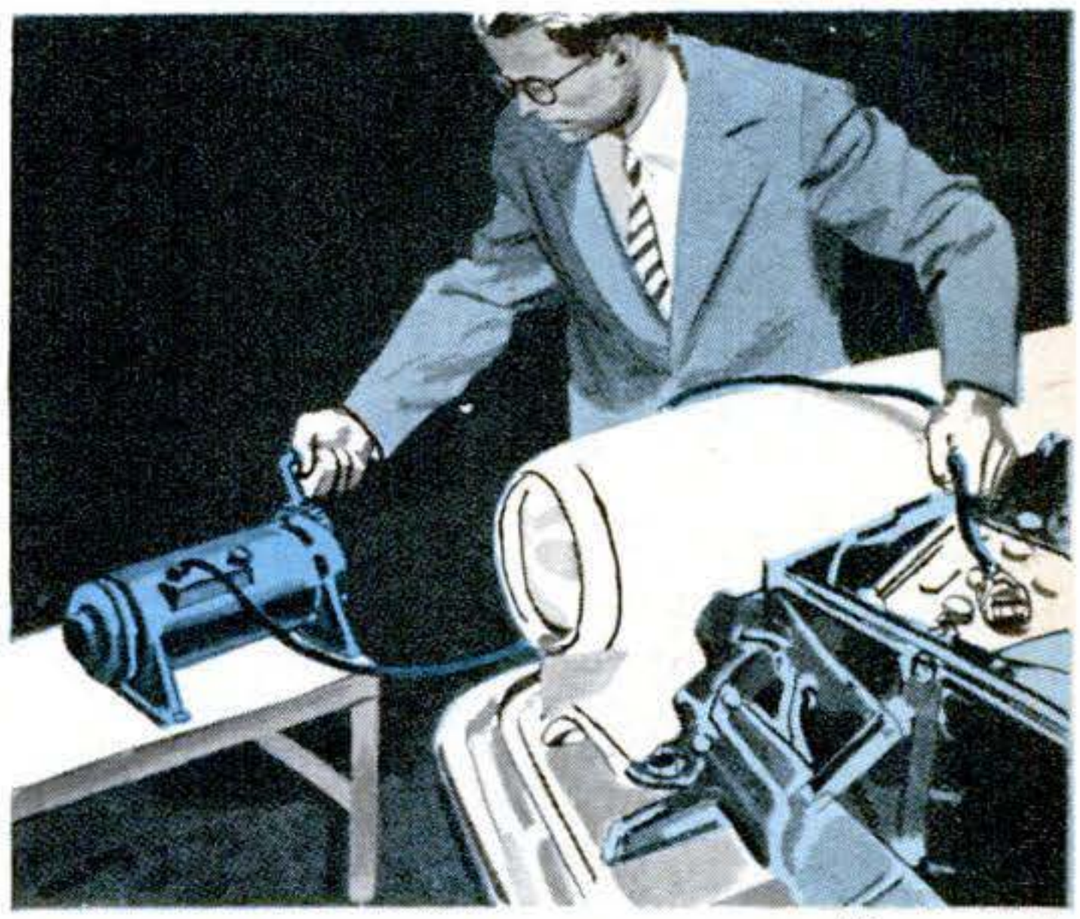
I'd Like to see them make...

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science Monthly* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.

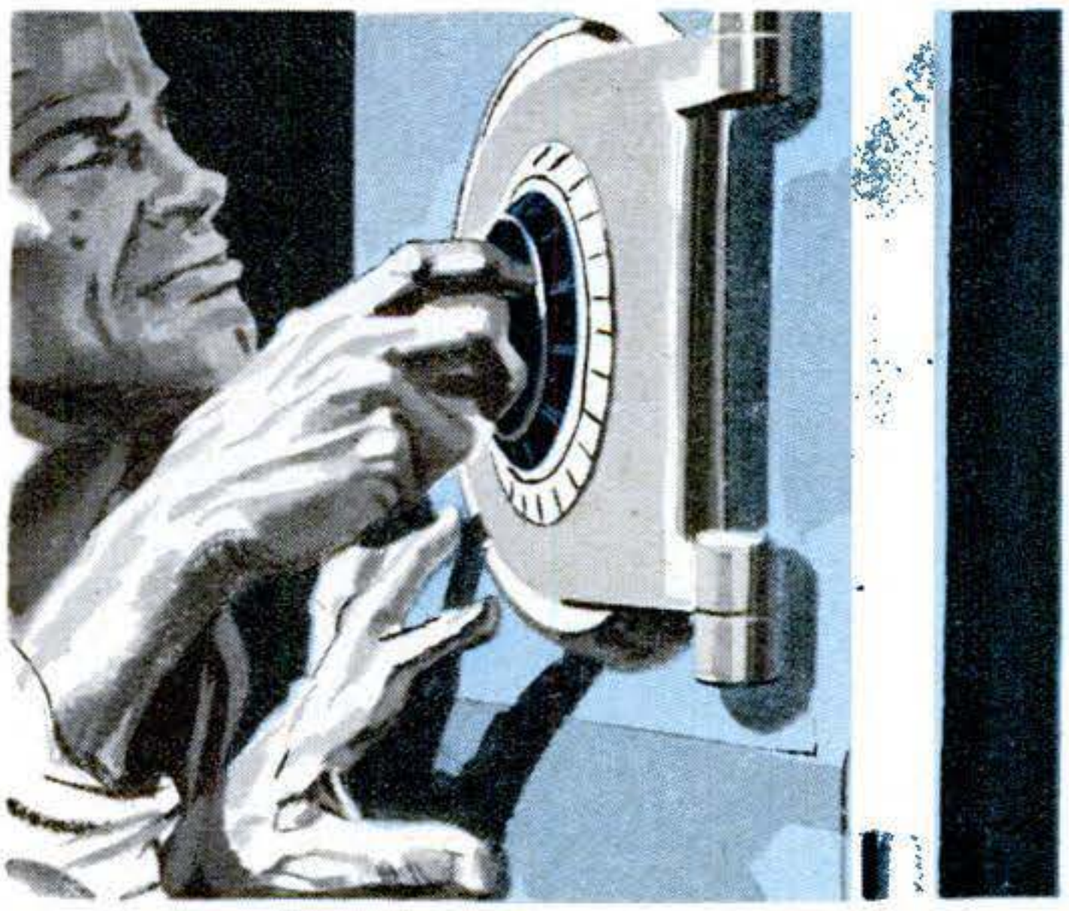


AN UNGROUNDED BATHROOM OUTLET fed by an isolation transformer to separate it from the house line, thus eliminating most bathroom shock hazards.—*Walter Beglen, Pittsburgh.*

AN EGG BEATER with a rubber suction cup on the bottom to prevent it from skidding all over the bowl when you put on the pressure. —*Mrs. Mary Lauto, Brooklyn, N. Y.*



A HAND-OPERATED GENERATOR small enough to store in the garage but strong enough to beef up a weak battery to start a car.—*R. L. Watkins, Cincinnati.*



A RATCHET for safe combinations to drown out the sound of the falling tumblers and thus stymie safe-crackers who do their stuff by ear.—*Carl Ayars, Bridgeton, N. J.*

BABY HIGH CHAIRS with a drawer that slides out from under the seat to hold bibs, diapers, cleansing tissues and small toys.—*Mrs. S. Milazzo, Cincinnati.*

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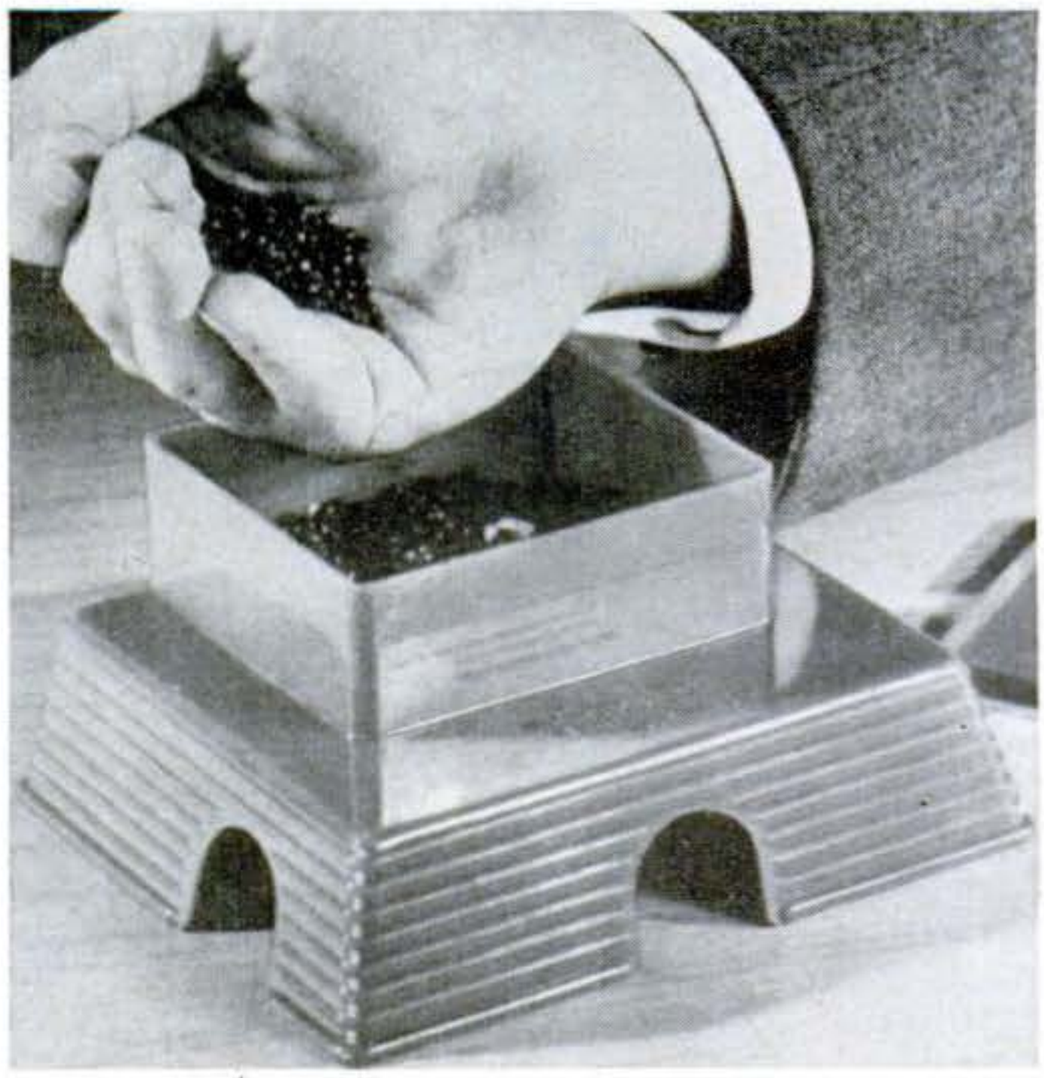
Deep Freeze of Auto Parts Helps Make Perfect Fits

SOME workers along Plymouth assembly lines have a handy place to chill a bottle of pop. They just stick it into their parts cold cabinet, left above, for a minute. The cabinet's real job is to shrink key auto parts so they slip into place without the risk of shearing bits of metal in a force fit. As the metal warms and expands the part is locked in. Left, a reaction shaft for Hy-Drive is pulled from a dry-ice cabinet where it has shrunk .002 inch to fit, right, into a torque-converter housing. Exhaust-valve seat inserts are chilled with liquid nitrogen to 320° below zero Fahrenheit.

Radio Makes Model Do Tricks

THIS radio-controlled model of an amphibious jeep will do everything but roll over and play dead. On command from its master, 250 feet away, it will run forward, back, turn, blow a horn or siren, or fire blank cartridges. It won 15-year-old Don Trumbull, of Milford, Conn., an award in Ford's 1953 Industrial Arts competition.



Plastic Trap Poisons Mice

THE plastic bait station above feeds poison to mice automatically. The cereal-type bait, a slow-acting anticoagulant, feeds down to a hidden pan, exposing a little at a time. The hood and small entrance holes appeal to a mouse's instinct to hide while feeding, keep out larger animals. Motomco Inc. markets it.

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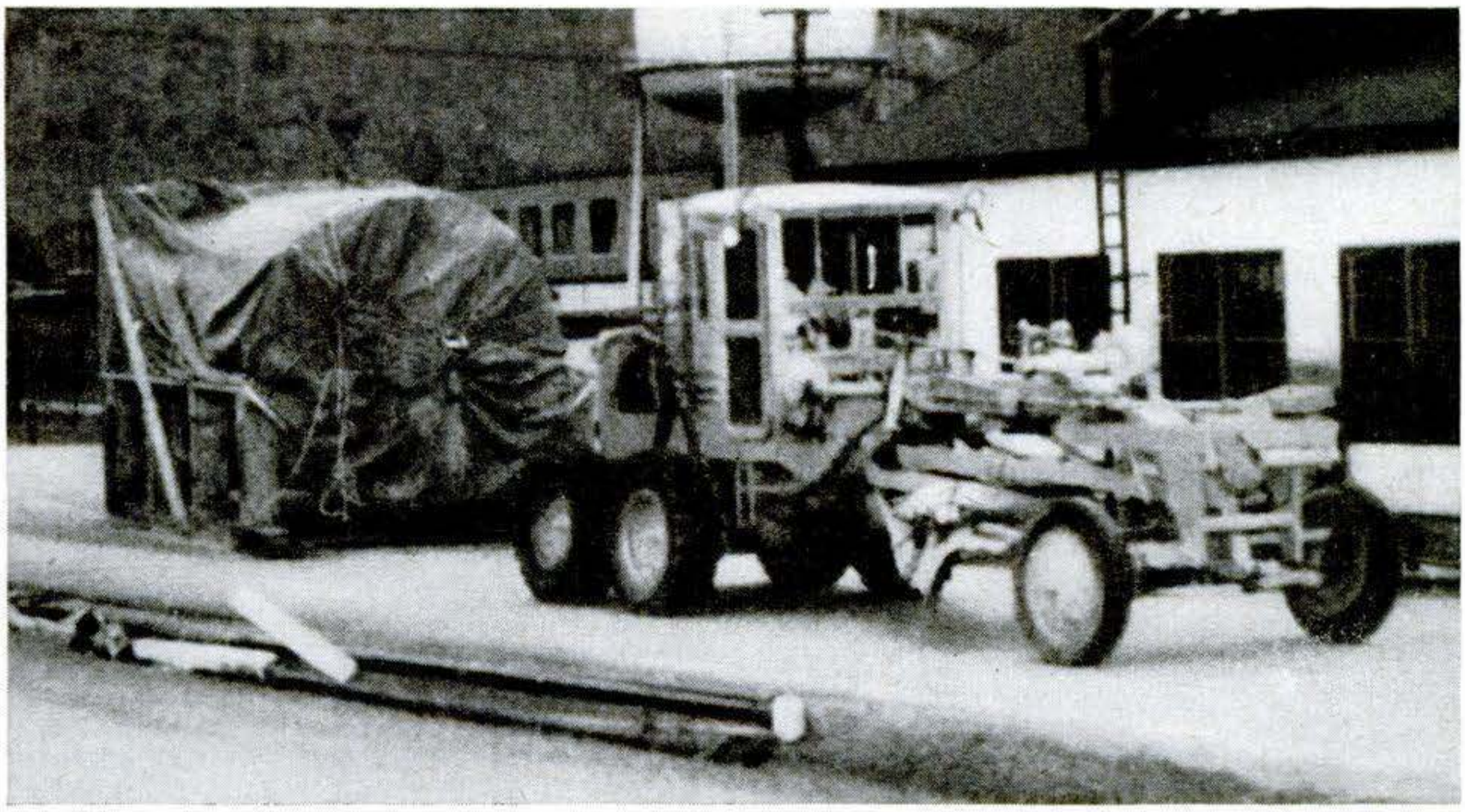
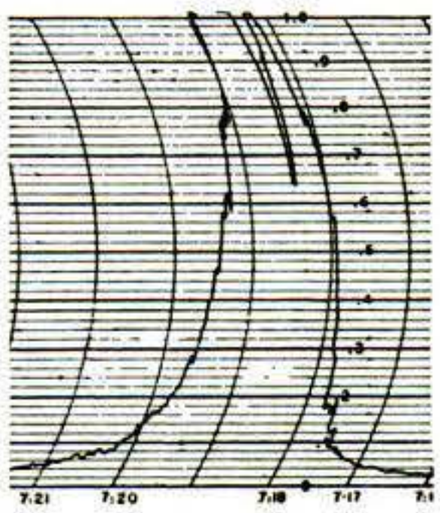
An Atomic Dragon's Eerie Funeral



When Canadian scientists hauled away the corpse of a reactor that went berserk, radiation charts in the buildings that it passed shot up like this ▶



By Bill Bantey

THIS is the story of a funeral—the strangest funeral in the history of man. The coffin was a huge canvas bag. The hearse was a towing grader and the grave, a giant hole. Atomic scientists from the U. S. and Canada were the mourners.

The corpse was Calandria, largest and most dangerous radioactive object that has ever been handled. Experts say the radioactivity of this 2½-ton aluminum tank, which was the heart of a great nuclear reactor, equals that of about half of the radium ever mined in the world.

Calandria operated for five years—a longer life than generally predicted for such a heavy-water, natural-uranium reactor—at the Chalk River, Ont., site of Canada's atomic energy plant. Then, last December 12, alarms sounded throughout the reactor building.

Sensitive monitoring instruments had detected a burst of radioactivity in the 200-foot stack of the isotope-producing NRX reactor, world's most intense source of neutrons. Within its core—the aluminum tank that technicians call a calandria—several tubes containing uranium rods

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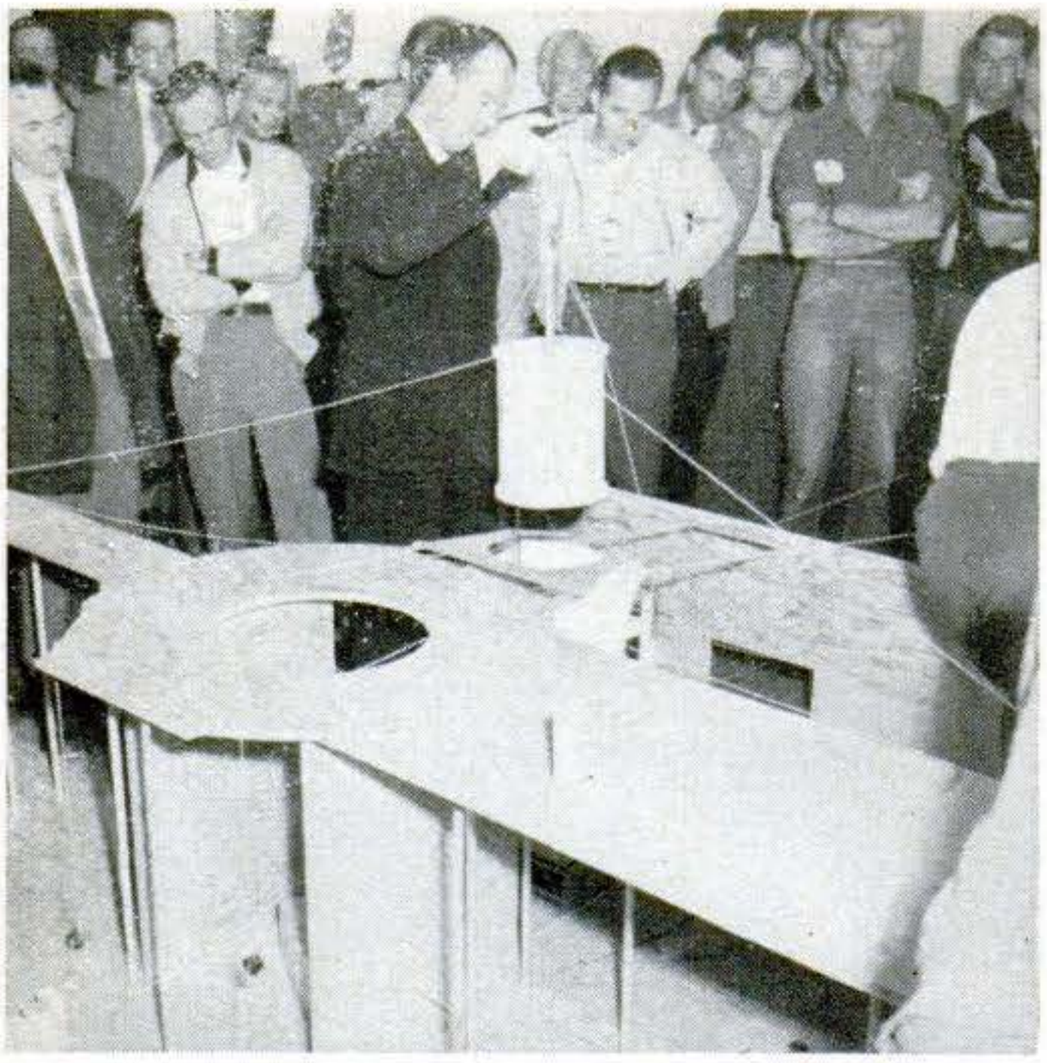


USING SCALE MODEL of reactor, 70-man team practices removing aluminum Calandria. Crane operator, holding wooden miniature of it, rehearses plan of handling it with ropes.

had burst, contaminating the reactor and putting it out of action.

A siren wailed and, all over the plant, personnel quit their posts in a well-understood evacuation procedure. Only senior officers remained, to supervise a survey of the radioactive contamination that had fallen upon the project grounds, and to assess the damage to the reactor.

The radioactivity strewn over the plant was not enough to constitute a health menace, but could upset delicate experiments if tracked about, Radiation Hazards Control Branch experts found.

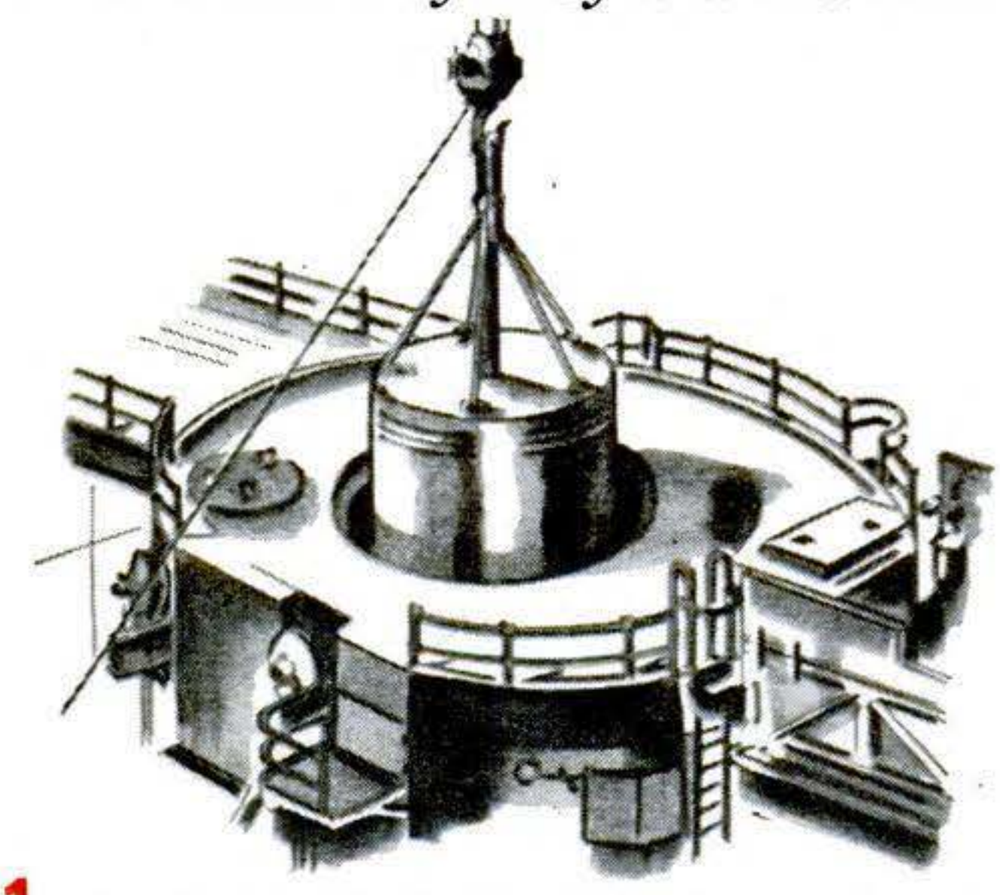
Under direction of Gordon W. Hatfield, the plant's manager of Industrial Operations, and the staff, a "restoration program" of decontaminating the area and overhauling the reactor began. The No. 1 Radiation Detection Unit of the Canadian Army, and the Royal Canadian Air Force, contributed manpower to help and gain experience in the work. Scientists and technicians from U. S. atomic energy projects arrived to assist. The alarms had evacuated the plant on a Friday afternoon; by Monday, all employees were back at work.

Technicians built special viewing devices to examine the interior of the reactor, and determine which of the 176 uranium-containing tubes of Calandria had burst. All 176 tubes had to be removed—a task complicated by their powerful radiation, and by the leaking contamination. Even with masks and protective clothing, men could work at it for only a few minutes' time safely. Then others had to take their places. When they had pulled out all the tubes, they studied the remaining radioactivity with probes.

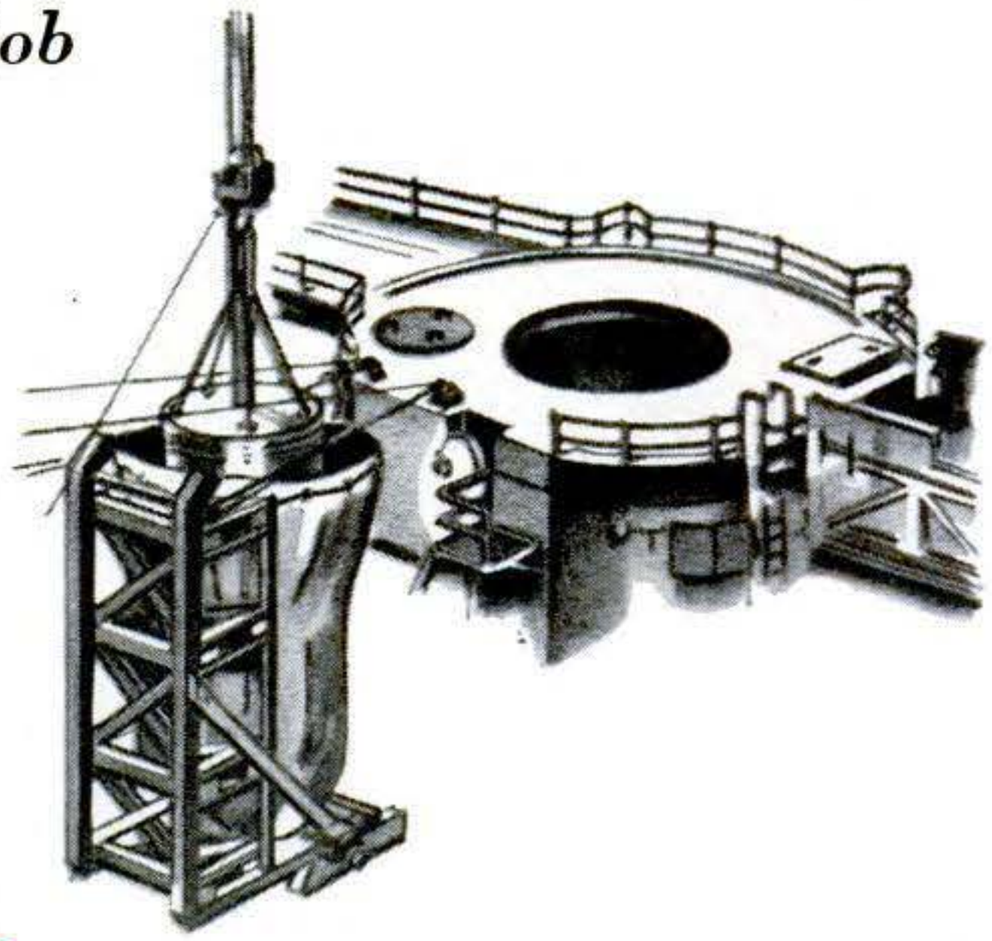
Next step would be the dramatic operation of removing Calandria itself. Well-rehearsed in advance, this was the plan:

An overhead crane would lift the tank, 10 feet high and eight feet in diameter, out of the 35-foot-high reactor structure.

This is the way they did the ticklish job



1 OVERHEAD CRANE hoisted the tank out of reactor and swung it to waiting cradle.



2 CANVAS BAG on upended cradle received tank. Ropes closed bag, lowered cradle.

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Then the tank would be dropped into a huge canvas bag, on a cradle fitted with skids and upended against the side of the reactor. The cradle would be lowered to horizontal, resting on its skids on the building's floor. Finally it would be towed to a burial ground outside the plant by a grader, the heaviest rubber-tired vehicle on the project.

Using scale models of the reactor, catwalks and Calandria, a team of 70 men practiced the operation thoroughly. A dress rehearsal followed.

A steel cylinder filled with sand, to match the weight of the real Calandria, was lowered into the reactor. The removal of shielding from above Calandria had allowed room to do this. Wearing white coveralls and breathing masks, the crew took up their positions. An announcer in the control room called out directions to them. Thus the team learned to handle the maze of ropes that pulled drawstrings to close the bag around the dummy tank, lowered the cradle through a 65-degree angle, and then pulled a pin detaching the lines.

The Big Moment Arrives

All was now ready.

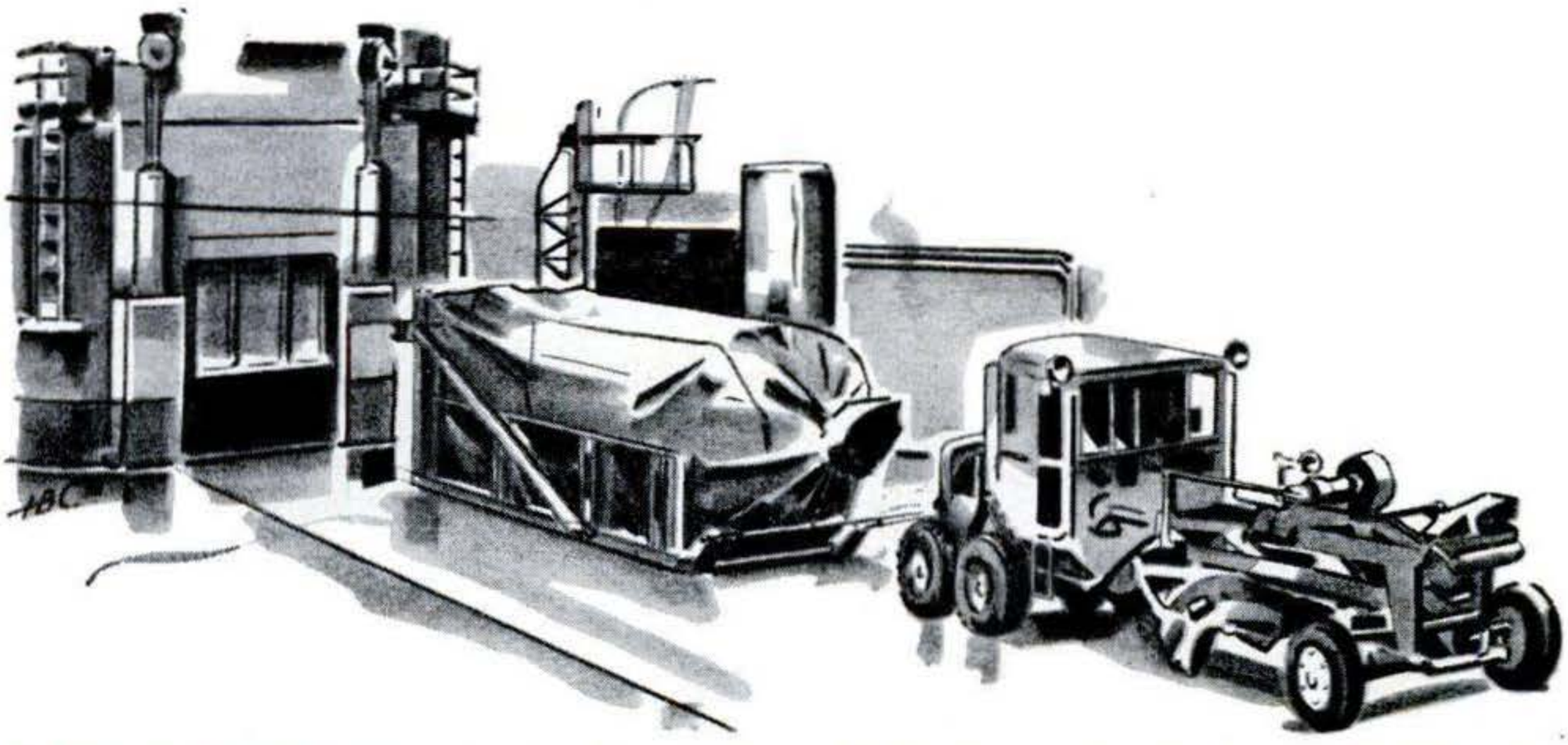
At 6:30 next evening, the announcer in the control room began calling out the 28 steps of the real operation:

"Step Number One, attach hook to lifting device and align hook for lifting . . . Step Number Two, raise Calandria six feet. Raise Calandria six feet . . ."

MASKED AGAINST INHALING radioactive dust, atomic experts use flashlight and mirror to inspect the contents of lead-sheathed tool that pulled uranium rods from Calandria.

Slowly the aluminum tank rose into sight above the reactor structure. Twelve men, trained to handle any of the crew members' jobs, stood by to cope with emergencies. Project photographers were at shielded points of vantage.

"Health survey men take readings," the announcer directed. They moved forward with radiation instruments and quickly measured the intense rays



3 **CRADLE, BEARING TANK,** was towed on skids to burial ground by a grader. Thick lead shield, fastened to back of vehicle's cab, protected driver from intense radioactivity.

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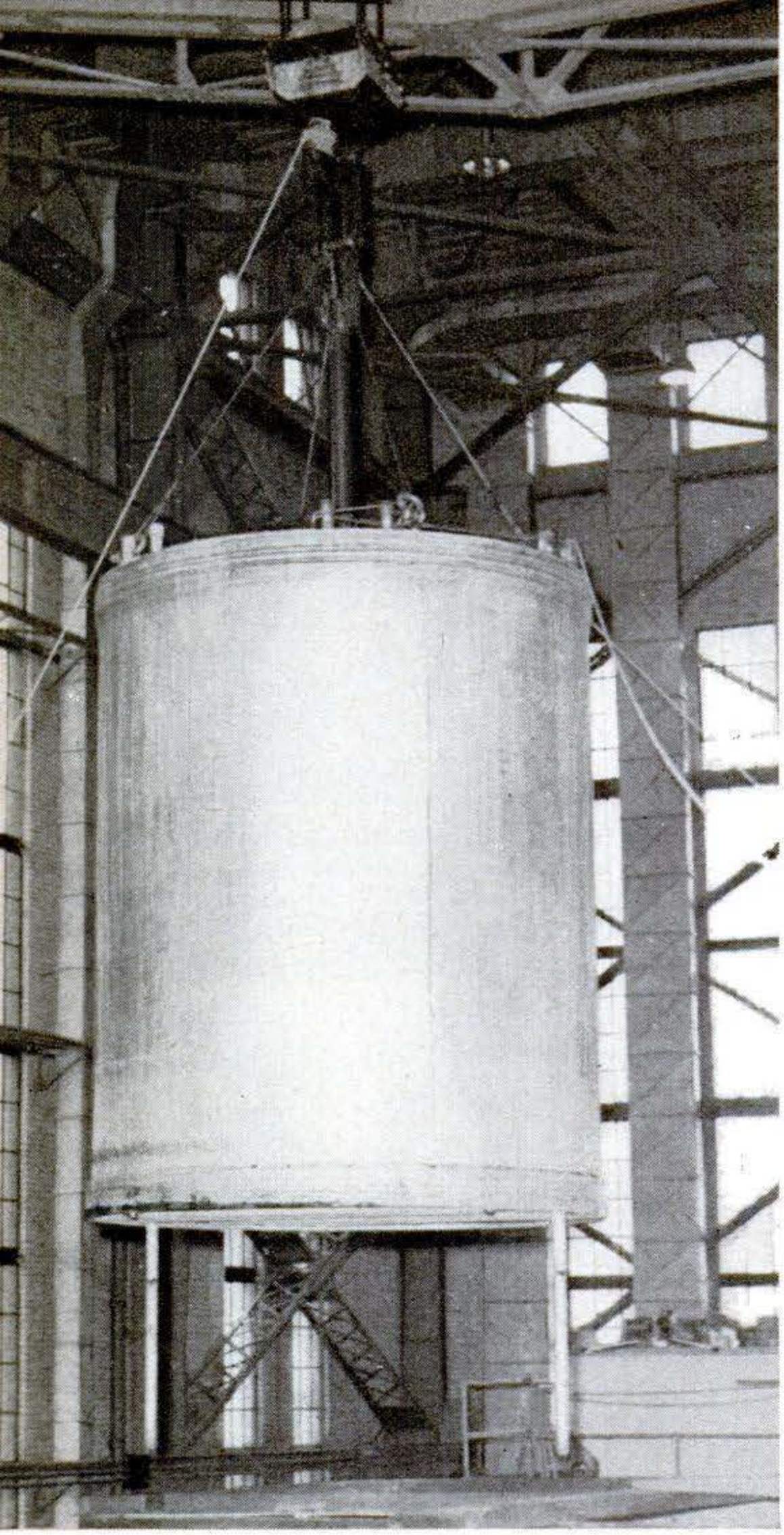

LARGEST RADIOACTIVE OBJECT ever handled, 2½-ton Calandria emerges from reactor. No one is to be seen in picture because members of crew are at respectful distance.

streaming from the tank. An announcement was made:

"Four minutes will be allowed for photographs." Cameramen, moving to marked positions, took pictures to be used for later scientific studies.

Now the crane man, in a well-shielded booth high in the building, swung Calandria directly above the canvas bag. Squarely and smoothly, he lowered it in. The cradle and its load swung downward to the floor—and then the unpredictable happened. One of the many ropes snagged. But the stand-by crew, who were there for just such a contingency, succeeded in freeing it quickly.

"Pull lowering-cable pin from skid," the announcer resumed. Emerging from behind shields, three men pulled a rope attached to the pin.

"Move grader to towing cable . . . Secure, and tow skid to first position . . . Rope cutters, cut all trailing ropes . . ." Thirty minutes had elapsed.

"Supervisor Number Three, resume towing," ordered the announcer. "Complete control is transferred to you." Thick lead shielding, fastened to the back of the grader's cab, protected the driver ready at its wheel.

Calandria Takes Last Ride

A long whistle blast warned all in the plant that the funeral procession was under way. Supervisors in their cars led its slow movement. Next came the grader towing Calandria. Health surveyors, checking the road for possible contamination, brought up the rear. A deserted scene confronted the eerie cortege. Guards had retreated from sight. The usually well-guarded main gate stood wide open.

In buildings along the route were radiation-monitoring instruments, operating continuously. As Calandria went by, their pens shot right off the charts.

Calandria reached its final resting place, a site well away from the project but within the 10,000 acres it controls. There, a bulldozer heaped sand over the tank to shield it. Calandria was dead and buried.

A brief epilogue concludes the story: Chalk River's reactor will be restored to service. Its massive outer structure is undamaged, and a new Calandria will be placed within it.

As for the buried Calandria, its grave will not go unvisited. One end of the tank has been left accessible, for study when its radioactivity dies down sufficiently—so scientists can learn, for example, how neutrons have altered its metal's structural properties. But so formidable is this atomic dragon, even in death, that it will be perilous to approach for some time to come. END

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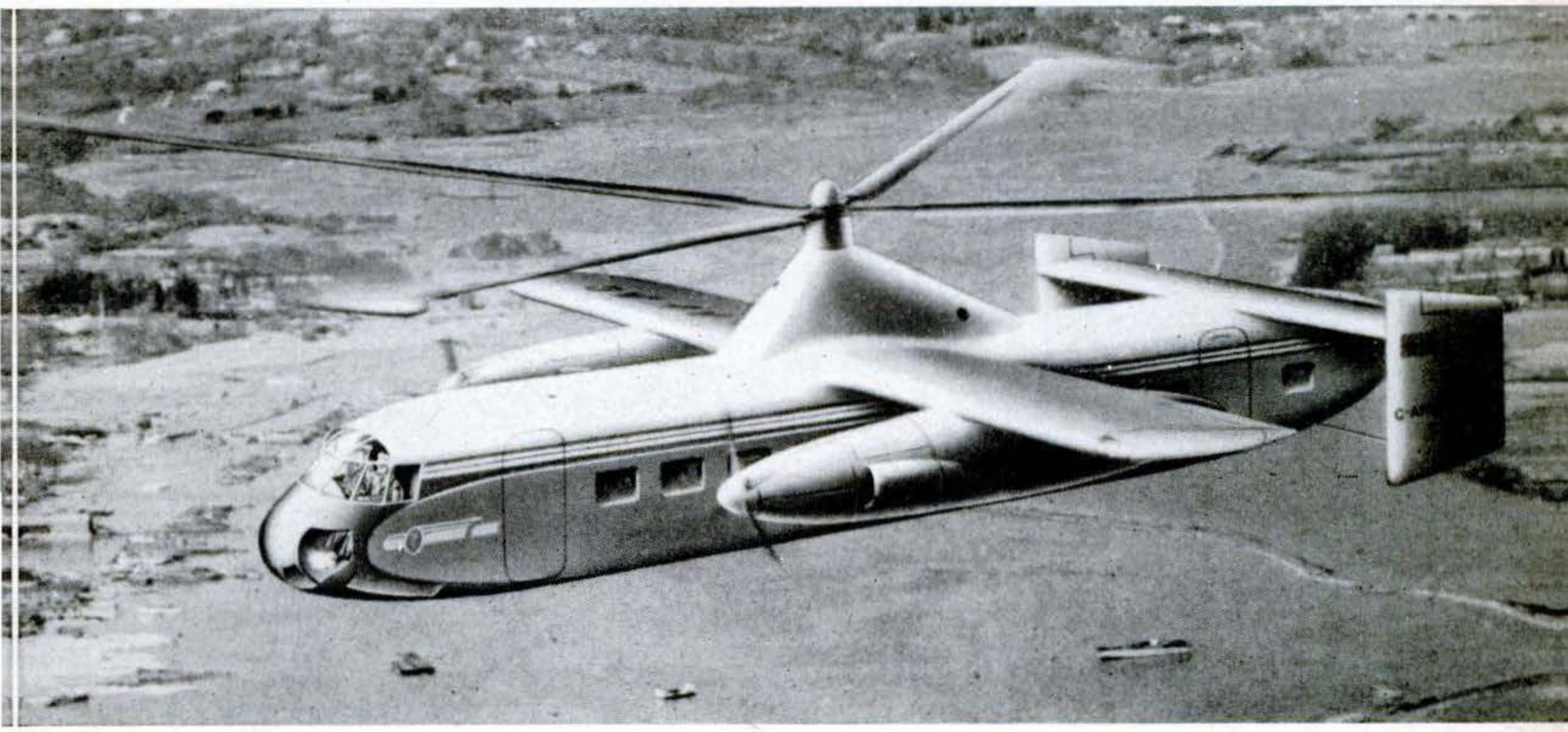
Here's One Place the Railroad Must Wait for Motorist

In Burke, Idaho, when you want five gallons of gas the Northern Pacific Railroad just holds its iron horses while you get it. The town's at the bottom of a V-shaped canyon, the single narrow street is on piles over a river, and the tracks run right down the middle of the street. Locomotives clear the gas pump by only 25 inches, and it's the only gas station within seven miles. First one on the street—train or car—has right of way.

British Plan Big Copter for City-to-City Express Service

The big helicopter below, soon to go into production, is boomed as a rival to twin-engine aircraft on intercity runs. Called the Rotodyne, it will carry 40 to 50 passengers, be powered by two propeller turbines using tip-driven jet rotors. Large loading doors at the rear will make the craft suitable for a car ferry or freighter. Fairey Aviation will build the experimental helicopter for the British Ministry of Supply.



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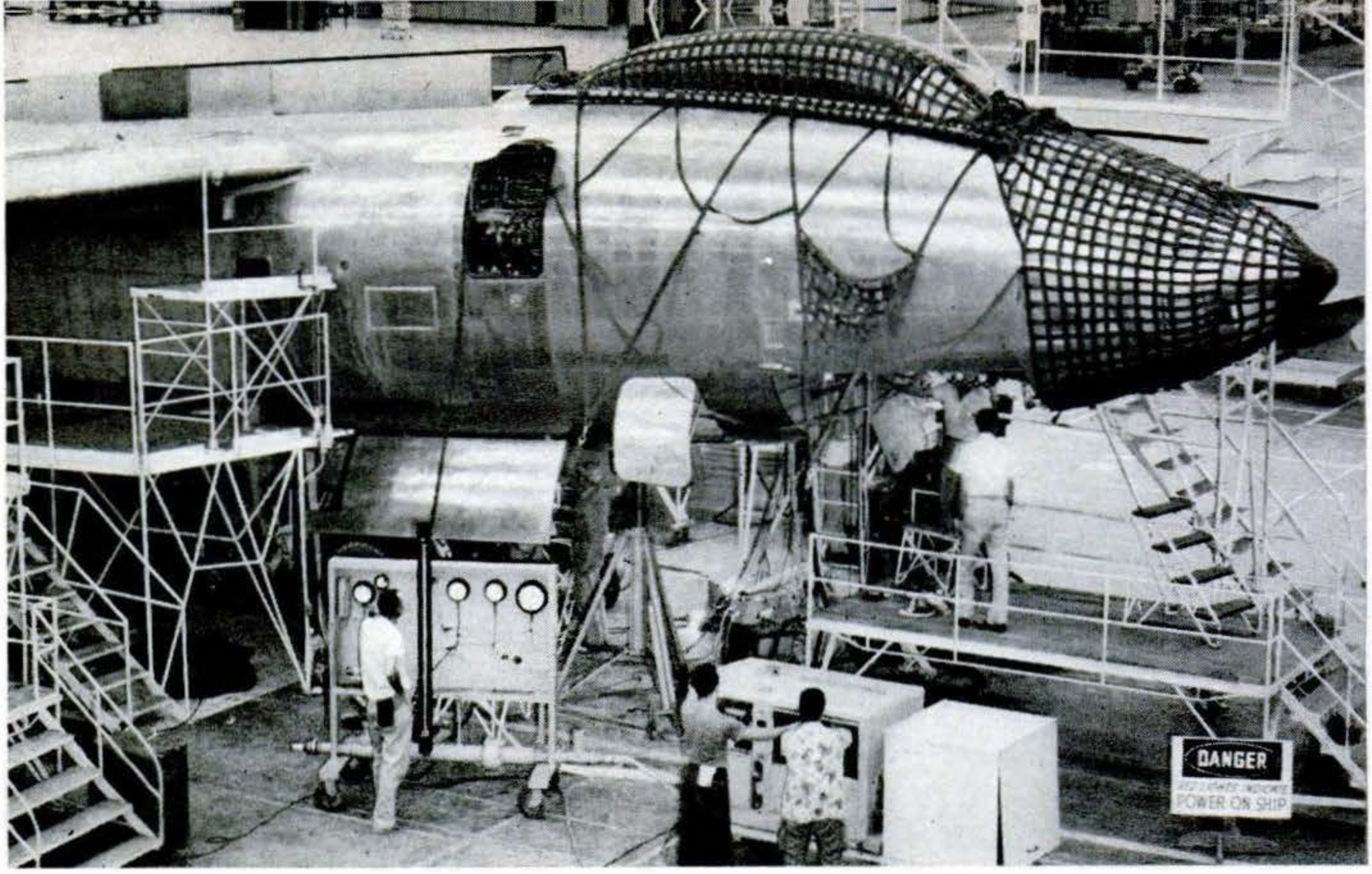

Sock on the Nose of Jet Bomber Protects Men During Tests

As HE yanked up his socks on the job one day, Joe Gabriel, aircraft worker, got an idea. Now a giant sock covers windows of B-47 bombers undergoing internal pressure tests at Lockheed's Marietta, Ga., plant. When the Stratojet makes like it's flying 40,000 feet up, the nylon net traps any glass blown out. Previously, the plant used a steel cage to protect engineers running tests. It cost $5,000, the sock only $1,500.

▶▶▶Half-carat diamonds look as big as billiard balls on the viewer of a new jewelers' instrument. The tiniest imperfections—flaws in the stone or cutting irregularities—show up on the image when the Magnascope throws a beam of light through the gem.

He Records Fish Talk

CURIOUS to know what sounds fish make under water, the German above made a tape recording at the aquarium in West Berlin. What he got was a lot of grinding noises, picked up by a microphone stuck through the wall of the tank at upper left.

They Get 150 Miles to Gallon

A NEW 1½-hp. air-cooled bike motor revs up when the cyclist pedals a few feet. Then a drive wheel takes over, turning the front wheel by friction. The Travis Products Co., Chicago, says the one-lunger propels a bike 30 m.p.h., does 150 miles on a gallon.

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You'll Have Power Steering ...and Like It

How contented can he get? The happy man above has just shoehorned a two-ton car into a tight parking spot. He thinks power steering is wonderful.

It's the hottest auto gizmo since gears went shiftless. Next year it can be factory-fitted to almost every U. S. make.

By Frank Rowsome Jr.

IF YOU'RE a reasonably typical car buyer next year, you're likely to tell the salesman you don't want power steering, and doubt if you'll ever want it. Nevertheless, you'll probably have it before long, and be tickled pink with it.

Since 1951 it has shot up from a Chrysler extra to an option that can be had in 1954 on every U.S. car but the Henry J. On some Buicks, Kaisers and Chryslers it is not even an option, but is standard equipment. The problem now is not selling power-steering units. It's making them fast enough to satisfy next year's customers.

The price has dropped from $200-plus to $125 for some models, and will almost certainly go lower. It is installed on about 95 percent of current Cadillacs, 75 percent of Lincolns, and steadily growing proportions of middle-priced cars. Even the light makes, with easier steering and more cost-conscious buyers, are going for power steering at a fast clip.

How come? This buying binge can't be explained solely by the Little Lady, even though she's doubtless a potent factor. Good times account for some of it. A third factor is the high-mileage driver—salesmen and others who regularly slap on thousands of miles a month. The word they spread is that end-of-the-day fatigue after a 500-mile run

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is conspicuously lessened with power steering on your car.

Not that it's all sweetness and here's-my-money. A Sour School of autoists holds that it's just one more costly, bothersome and largely unnecessary gadget. "I'm not so decrepit I can't move a wheel myself," one of these characters will grumble, "and I'm damned if I want to get into a tight turn with some hydraulic dingus to louse up the steering."

This bilious viewpoint quite often changes after a few hundred miles behind a hydraulic-assist wheel. (Not instantly—for some cars and drivers there's a get-accustomed period.) Pretty soon power steering gets to feel familiar and rather wonderful. The shock comes later, when you drive a car without it. Then you wonder why you were ever willing to wrench a sluggish, trucklike wheel around on a long trip.

Linkage

Here the power cylinder, resembling glorified shock absorber, is placed down beside the regular steering links. Valves may be in it, or at the pitman arm. Pump is separate.

Integral

Valves and power cylinder together are incorporated with the steering gear itself on this type, though the pump and reservoir are separate. Integral units were the first in use.

Design squabbles. Passenger-car power steering is still so new that basic design hasn't jelled yet. There are sharp technical controversies as to whether the integral or linkage type is better, whether a few pounds of effort should be retained before boost comes in, and as to how much the steering ratio can safely be dropped with power.

Actually, there are more similarities than differences. All current U.S. jobs are hydraulic-assist units that reduce—not eliminate—steering effort. (Studebaker announced a mechanical unit early this year but soon supplanted it with a hydraulic one.) They all use belt-driven pumps to force high-pressure oil into actuating cylinders. And they are all heavily engineered to "fail safe"—never to do worse than to leave you without assist.

The integral-vs.-linkage issue is a nicely balanced one. An integral unit appears to be a more "elegant" design, to have shorter high-pressure hoses that flex less, and to be better protected against rocks and ice. But a linkage unit may be quieter (the steering column is a fine route up which to telegraph noise and vibration), cheaper to make, and more suited for installation on high-production cars. From a driver's viewpoint, both behave about the same.

You want some feel? Here the makers start shrilling at each other. In one corner of the ring is GM, seconded by Ford and some of the independents; in the other is Chrysler, seconded by Gemmer (which helped develop the Chrysler unit) and by Packard. The issue is this:

GM says that power should cut in only after the driver has exerted three to eight pounds of pressure on the wheel rim. Unless this effort is left in, a driver has no feel of the road, no cue as to how "hard" he's steering. This cue, according to the GM view, comes mainly through wheel resistance, and is essential to prevent a driving-on-ice sensation.

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Nonsense, retorts Chrysler tartly. Assist should occur as soon as you apply eight to 16 ounces to the wheel. Why retain an effort that is a big part of most highway driving? Why keep in a work load that, on crowned roads or in cross winds, is continuously fatiguing? Why provide an expensive mechanism and then set its valves so that it is mostly just a parking aid? Feel of the road is a complex entity made up of many more things than muscular sense; it includes cues from sight, sound and the middle ear, as well as an awareness of side loading from the viscera (guts, if you prefer) and seat of the pants.

Moreover, asks Chrysler with a touch of asperity, which steering-effort curve is likely to feel better: one that has the same shape as a manual curve but is lighter, or one that goes up steeply to a "break-through point" and then flattens off in a different direction?

Who's right? It's not easy for a casual driver to say. A newcomer to power, his reflexes adjusted to a manual gear, may accustom faster to a GM unit because it is more familiar. (He may even be disappointed to find that his wrists have noticeable work to do.) One circumstance where the newcomer may become aware of the GM unit is on a sweeping highway turn of decreasing radius. He starts around the turn without assist, and then nudges the wheel a bit more until power cuts in. Since the wheel *seems* to turn more freely, he oversteers and then has to back off a smidgen. (The wheel doesn't actually turn easier, of course; it is just that the rate of increase of resistance lessens.) This is a minor quirk and soon disappears, or correcting for it becomes unconscious.

On Chrysler units the steering wheel is delightfully—almost alarmingly—free at first. The proportional nature of wheel resistance is hard to detect at the beginning; a hand that has been hefting stones does not readily discriminate among pebbles. But when your reflexes are adapted, the wheel is a dilly to hold, and parking or tight turn-arounds are so easy they seem sinful.

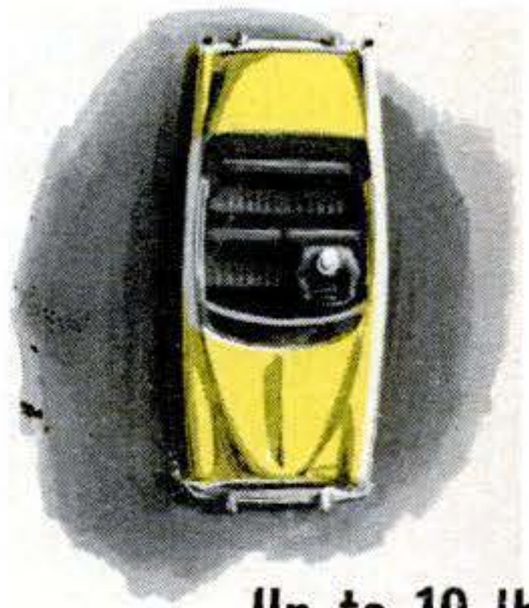
The gear also handles well in conditions where those who don't know power steering might think it would be bad—when you drive on the edge of "losing" it. Take a Chrysler too fast down a washboardy gravel road and you'll find that the corrections needed to slap the rear end back where it belongs are smaller and faster than they'd be with manual gear. It suggests that skid perceptions, at least, do not come to the brain from muscular feel.

Whither ratios? Deciding which system you prefer would be easier if the makers did not also disagree on steering ratios. Chrysler says in effect that with power there's no

Typical Manual Steering Effort

Without power, how hard you work depends on a lot of variables. But here are fair samples:

Ordinary highway



Up to 10 lb.

Street corner

10 to 15 lb.

Parallel parking

25 to 50 lb.

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need for the extremely high ratios used in recent years; GM agrees that ratios may come down—but only gradually, over a number of years.

Technically speaking, a car has at least three steering ratios. But for our purposes it is enough to say that the overall ratio relates steering-wheel turns to front-wheel deflection. The higher the numerical ratio, the more you have to crank the steering wheel to cock the front wheels over a given amount.

Ratios have climbed spectacularly in recent years. In 1929 the Chevrolet gear was 9.5 to 1; in 1930 Plymouth was 13 to 1. Current Fords are 26.3, Buicks 29, and the biggest Packards sport a steamboat 30.9.

Ratios have been kited, of course, in an attempt to keep steering effort down—despite such effort-absorbing trends as growing car weight, increased front-wheel load and baggier tires. Designers have also been jiggering front-end geometry for the same reason, adopting compromise caster angles that ease steering at a cost elsewhere, mainly in the self-centering tendency.

But the main penalty has been the ratio climb, and its "slower" steering. Some experts argue that the trend has gone beyond safety. They claim that so much wheel winding is needed for a major change in course that the quick swerve-for-safety has become almost impossible. They contend it is tough to turn a wheel far enough *fast enough* to make, say, a quick zig to duck a hilltop road hog, or to make a lightning lane-change to avoid a rear-end smash.

Power to the rescue? With hydraulic muscles to lick the effort problem, ratios

Who's Got What in Power Steering

Make	*Price (Fed.tax inc.)*	*Type*	*Over-All Ratio*		*Threshold*	*Manufacturer*
			Manual	*Power*		
CHEVROLET	$177.55	integral	23.1	22.1	3½ lb.	Saginaw
FORD	$134.40	linkage	26.3	26.3	3½ lb.	Bendix
PLYMOUTH	N.A.[1]	linkage	21.1	19.7	1 lb.	Monroe
BUICK	$177.40[2]	integral	29	26	3½ lb.	Saginaw
PONTIAC	$177.40	integral	25.1	26	3½ lb.	Saginaw
OLDSMOBILE	$177.40	integral	27.5	25.73	3½ lb.	Saginaw
DODGE 6	N.A.	linkage	21.1	20.4	1 lb.	Monroe
DODGE 8	N.A.	linkage	22.2	20.4	1 lb.	Ross
MERCURY	$151.50	linkage	26.4	26.4	3½ lb.	Bendix
NASH	$192.50	linkage	25.5	25.5	3½ lb.	Bendix
STUDEBAKER	$177.38	integral	24	21	3 lb.	Saginaw
CHRYSLER	$177.35[3]	integral	25.8	16.2	½ lb.	Gemmer
DE SOTO	$177.35	integral	25.8[4]	16.2	½ lb.	Gemmer
CADILLAC	$176.98	integral	25.47	25.47	3½ lb.	Saginaw
PACKARD	$195.	linkage	27.8[5]	22.5	1 lb.	Bendix
HUDSON	N.A.	linkage	25.6[6]	25.6	3 lb.	Saginaw
LINCOLN	$177.40	integral	26.1	21.3	7½ lb.	Saginaw
KAISER	$131.22[7]	linkage	25.1	25.1	4 lb.	Monroe

1. N.A.—Not available at press time 2. Standard on Roadmasters 3. Standard on Crown Imperials 4. 23.0 on De Soto Six 5. 30.9 on 300 and 400 models 6. 20.2 on Wasp and Super Wasp, with and without power 7. Standard on Dragons

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could be dropped, and compromised geometry might be corrected. That at least is the pious hope; the practice, as will be seen, may be something else.

So far, Chrysler leads in ratio-dropping. A manually steered Chrysler is 25.8 over-all, a power model 16.2. Lincoln goes from 26.1 to 21.3. A few other makes drop the ratio a couple of points with power; most of the others leave it unchanged. The GM view appears to be that drivers should not be expected to adapt to major changes overnight, and that ratios may be brought down a point or two a year. (Power-steer models of Olds and Cadillac are due to drop slightly in 1954.)

There are two additional reasons why ratios may not come down as fast as some drivers would like. One is cost. If a steering system is engineered so that it is primarily a manual job, with power as an extra, it is likely on high-production cars to be a linkage unit added to the regular gear. To change the ratio too would probably involve modifying the gear, which would boost cost. (Changing ratio by varying the length of the pitman arm is apt to mess up the geometry.)

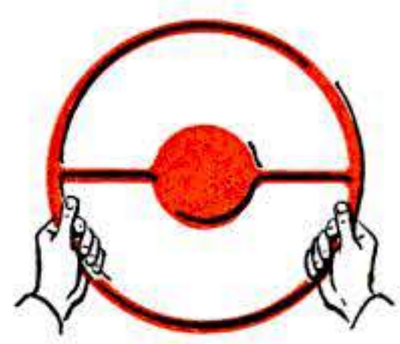
Dead-engine hazard. The second factor that may slow up the ratio drop is safety. On a power-steer car, steering effort shoots up tremendously the moment hydraulic assist quits—typically, if the engine stalls. This isn't particularly perilous at fair speed, since effort is relatively low then. But it can be awkward on a low-speed downhill turn; the situation might spell trouble, say, for a woman driver who kills her engine while turning sharply out of a driveway. In a second or two steering effort might jump from a few pounds to 30 pounds. The load goes up on all power-steered cars, of course, but much more on ones with a substantially lowered ratio.

For adequately muscled drivers, this low-speed stall is more startling than dangerous. Still, it would seem wise to brief a woman driver in your family that it *can* happen—and also hold a practice session in which you have her flip to neutral and

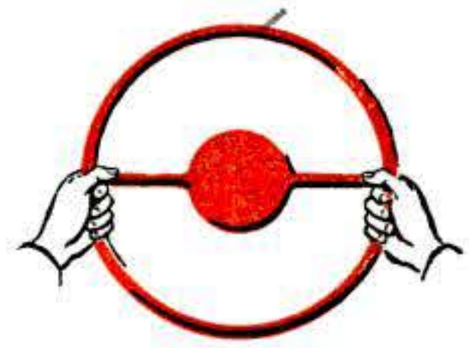
[*Continued on page 296*]

How to Hold a Steering Wheel

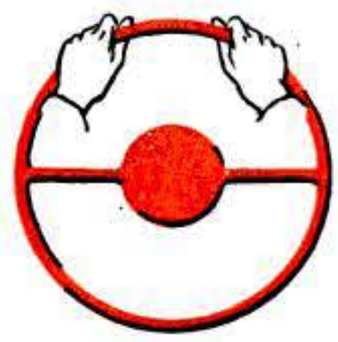
WITH or without power, there is no single "best way"—it depends on your size, car and preferences. But an informal poll of test drivers, men who clock hundreds of thousands of miles each year, shows marked agreement. The favorite position is with the hands low, almost in the lap—at 20 to 4 or even 25 to 5 on a clock dial.



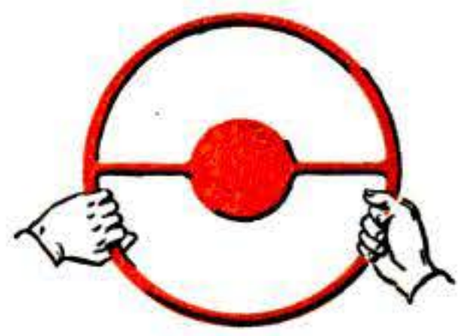
Basic position. Hands need not be symmetrically placed.



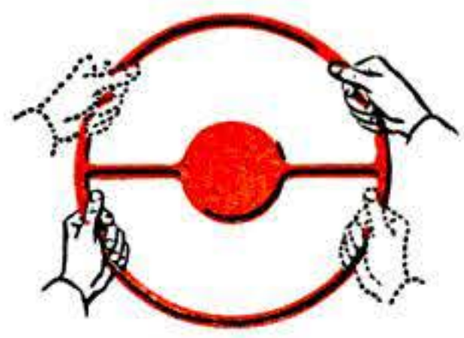
If crisis occurs, lift hands fast to get maximum advantage.



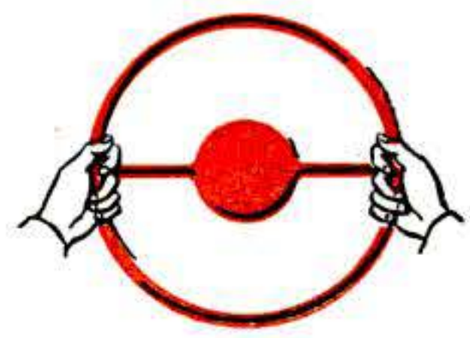
High hands are okay for a change. But fingers must now support much greater share of arm weight. Shoulders may be pulled away a little from seat back, and oversteering on turns is more likely.



Finger grip from underneath has the merit that if hand must turn wheel up high, grip is preserved. But if you hook your fingers over the lower half of the wheel rim, the rim twists out of your grip if you must bring your hand up fast.



On a turn, it's often better to "paw" wheel around by regripping it, rather than by crossing arms.

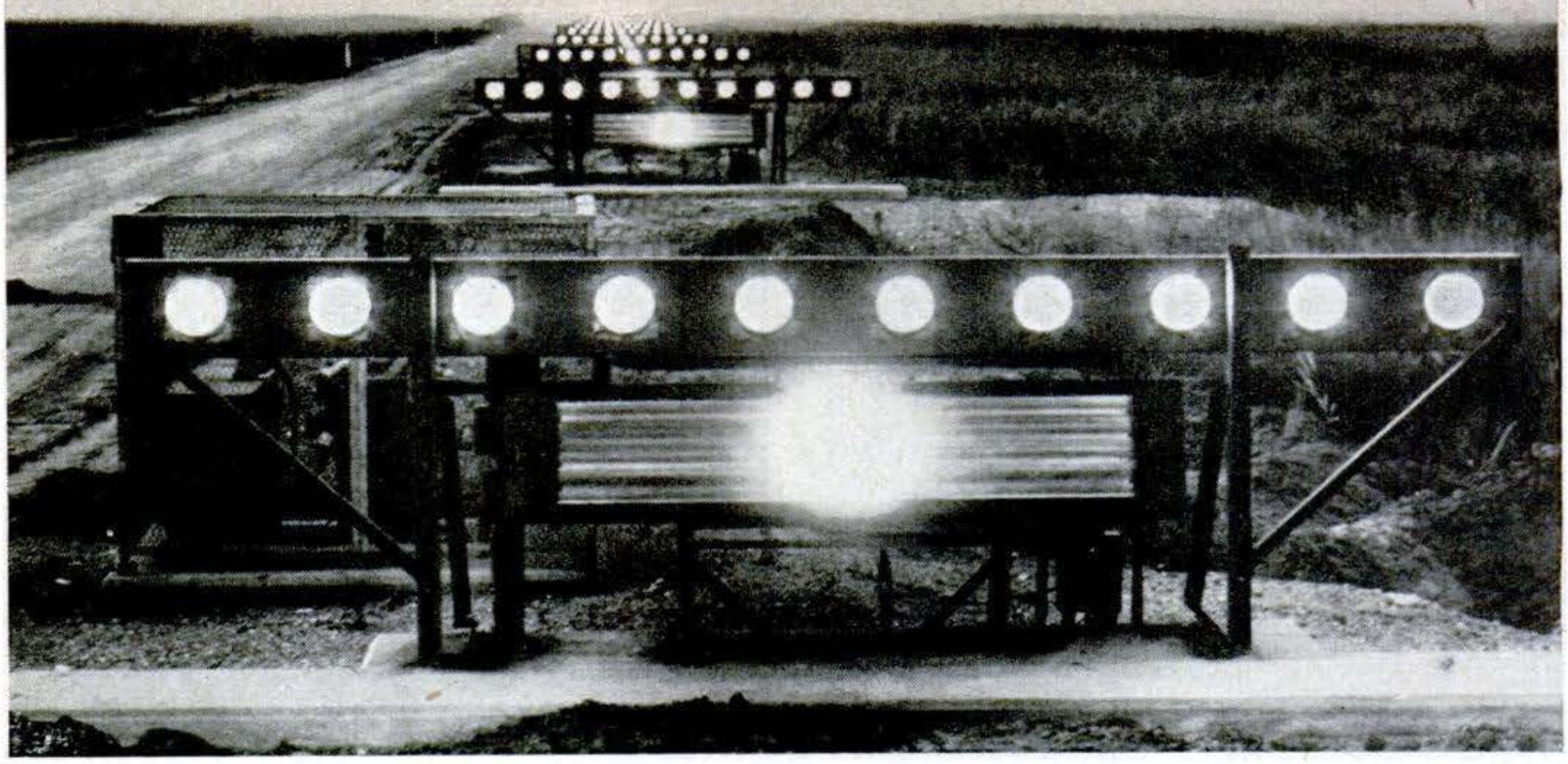


Lock a finger around a spoke if driving at high speed, as insurance against jerk of front-tire blowout.

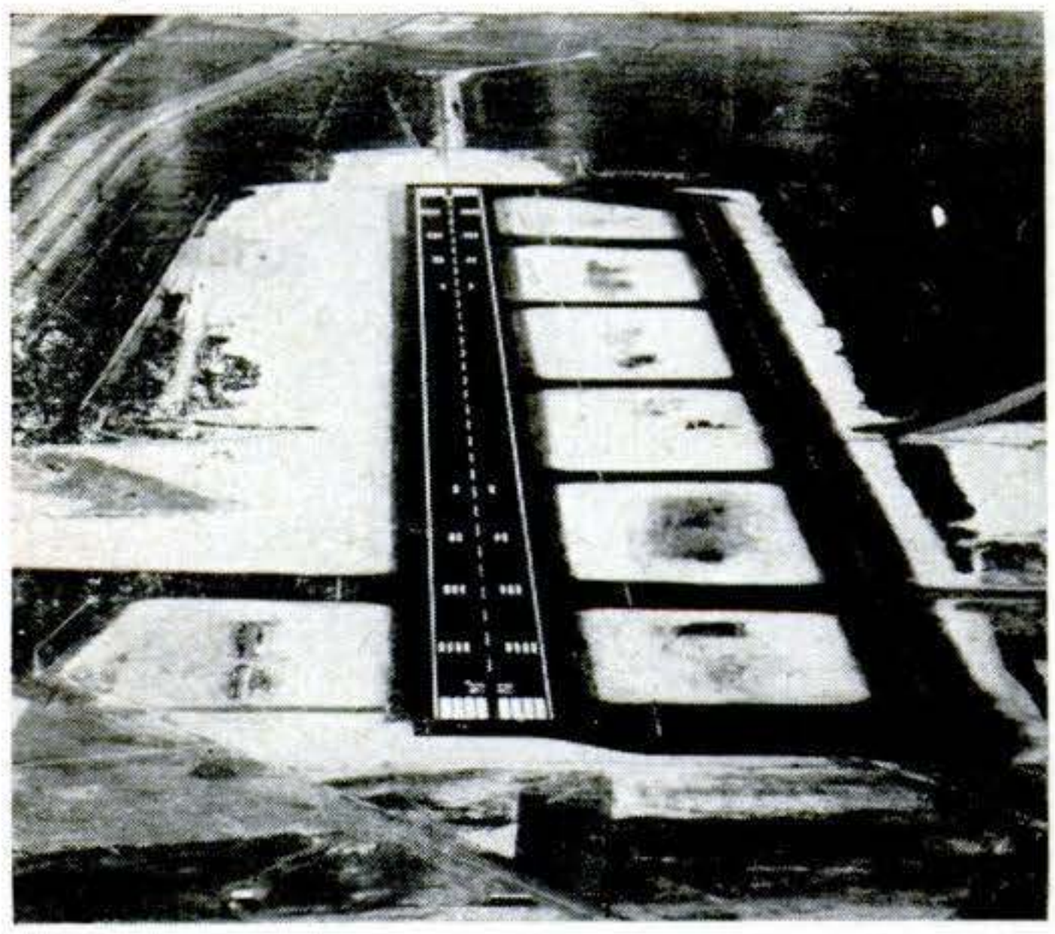
General Wheel-Handling Tips

Beware outdoor elbow. For most driver-car combinations, driving with the elbow out the window is tiring on a long trip. Use the elbow rest, or nothing; sit squarely behind the wheel; and use both hands equally.

On a tight turn, when you must fight the wheel around, don't just overpower it with steady pressure. Instead, get the extra wheel travel you need with short, sharp jabs. It gives more precise control and reduces the chance of risky oversteering.



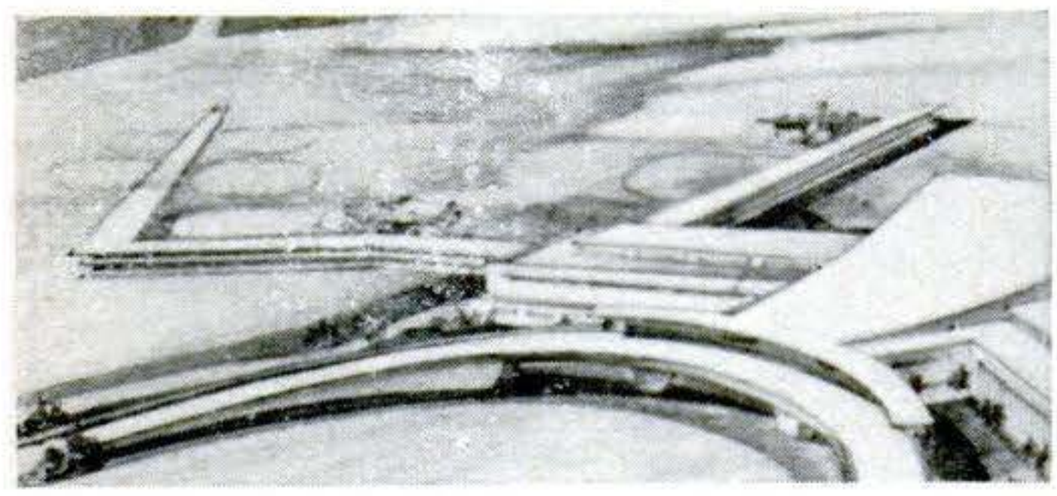
Airport News: Finger of Light Points Out Landing Approach



NEWARK AIRPORT now has a runway so fancy it cost more than the whole New Jersey airport when it was built 25 years ago. The $9,000,000 strip (left) stretches 7,000 feet and is 200 feet wide with 30-foot shoulders. A parallel taxiway feeds into it at seven points, so that as soon as a plane sets down it can leave the runway clear for the next one.

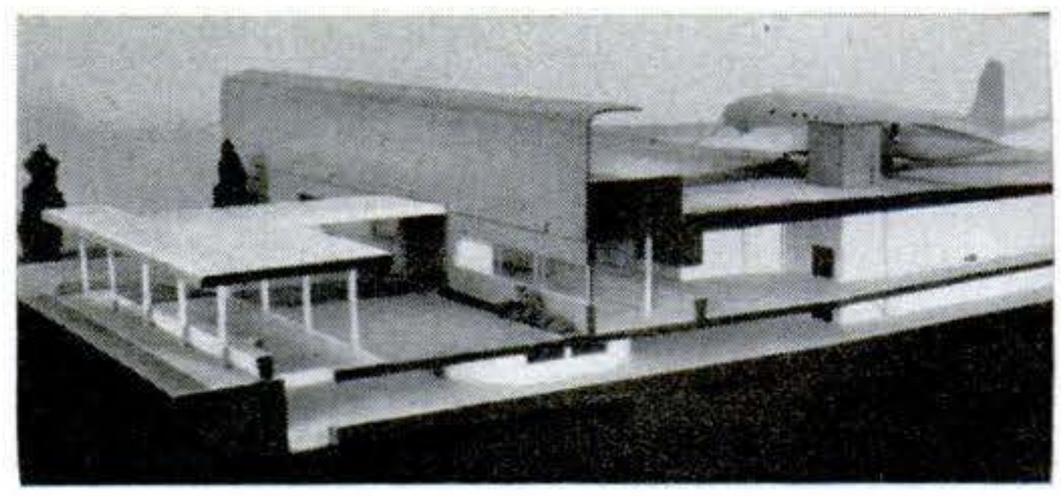
A pilot heading for the instrument-approach end of the runway faces 30 horizontal bars of light spaced 100 feet apart (above). Below each string of lights a single flasher goes on and off in sequence to point out the center of the approach like a moving tracer bullet.

Two-Way Piers to Speed Traffic



PASSENGERS at Miami's new airport will embark from long piers, just as if boarding a ship. The piers, double-decked, will extend from the terminal building to the loading area. Outgoing passengers will use the top floor, incoming passengers the ground floor. To keep auto traffic flowing in one direction, separate ramps will allow cars and buses to discharge passengers at the one level and load at the other. It is estimated that the finger piers will serve 33 passengers a minute.

Elevator to Load Jets



YOU'LL take an elevator to your plane at a new airport Australia is planning. As shown in the model above, the terminal is nested under a tilted apron to keep passengers away from the noise and blast of jet engines. The elevator, opening in line with the plane door, will keep travelers under cover all the time. When all are aboard, the pilot will roll the plane downhill off the apron and along the runway, well away from the terminal, before starting up his jet engines.

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LeRoy Neumayer, 22, drove this Herbert Special five miles at 233 m.p.h., set a new record.

Back-yard mechanics topple speed marks in

Super-Hot Rods

HOT-RODDERS—the boys who build their own streamliners, with native wit and a shoestring—are giving the professional racers stiffer and stiffer competition. At the rate they're going, some back-yard mechanic may soon wear the laurels of the late John Cobb, who traveled faster in an auto than anyone else has ever done.

Both national and international speed records went flying this fall when five super-hot rods, largely homemade, spun across the glittering, 14-mile straight-away on the Bonneville, Utah, salt flats.

Timed in their competition by the AAA, at a cost of about $1,000 a day, the glass-fiber and aluminum streamliners demonstrated more to hot-rodders than just superior speed.

Entries with new gasoline engines used current production models—with special fuel and carburetion, naturally. The fuel was an alcohol blend—in some cases 45 percent nitro methane.

The single diesel entry had a truck engine, fitted with two superchargers in

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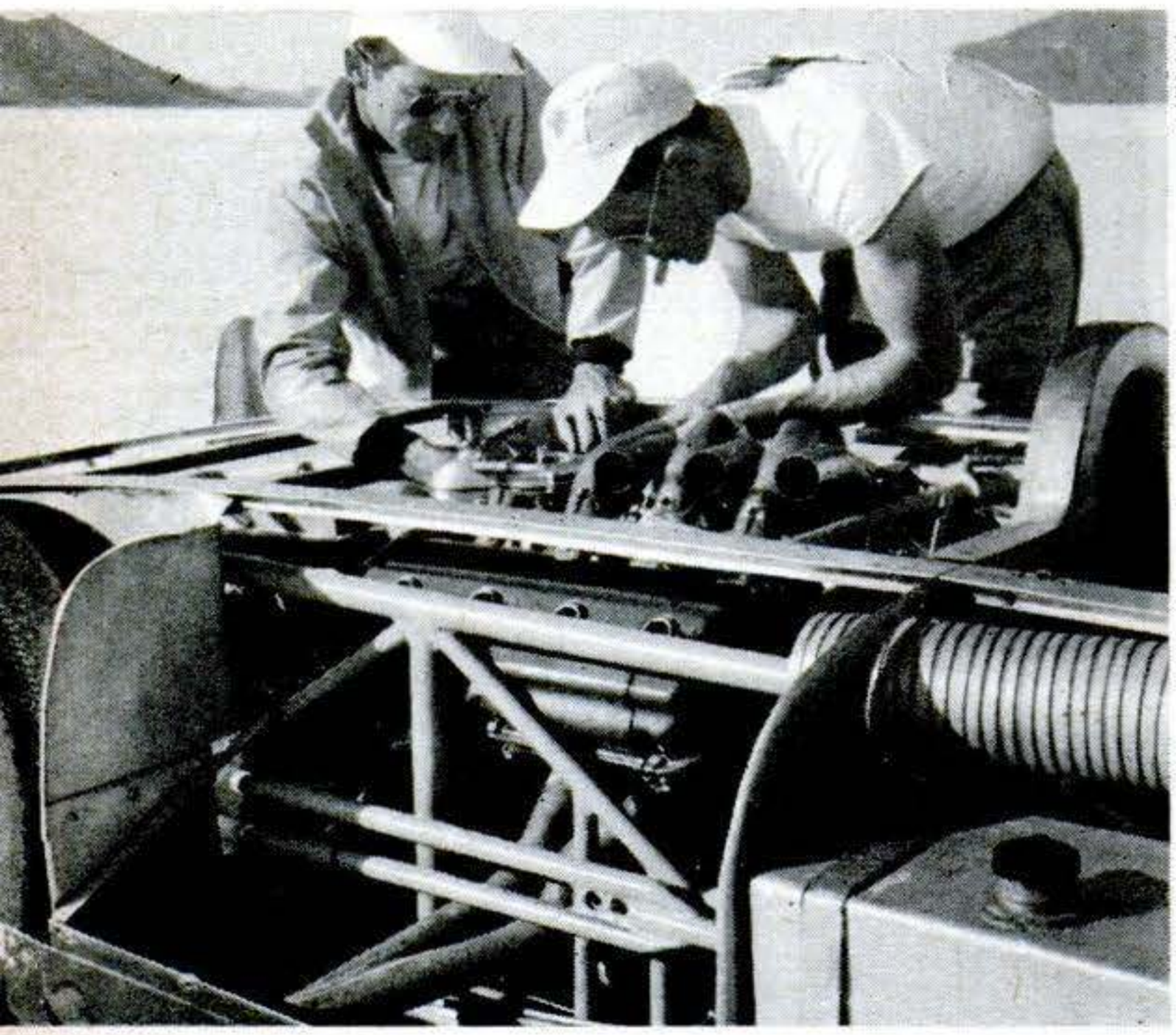
series. The projectile-like cars rolled to new records on special eight-ply tires with one-eighth inch of tread and two to three inches of running surface. The tires were inflated to 60-70 pounds and were said to be capable of doing 300 miles an hour.

Weight had been trimmed more intensively than ever. One car even had magnesium wheels.—*Andrew R. Boone.*

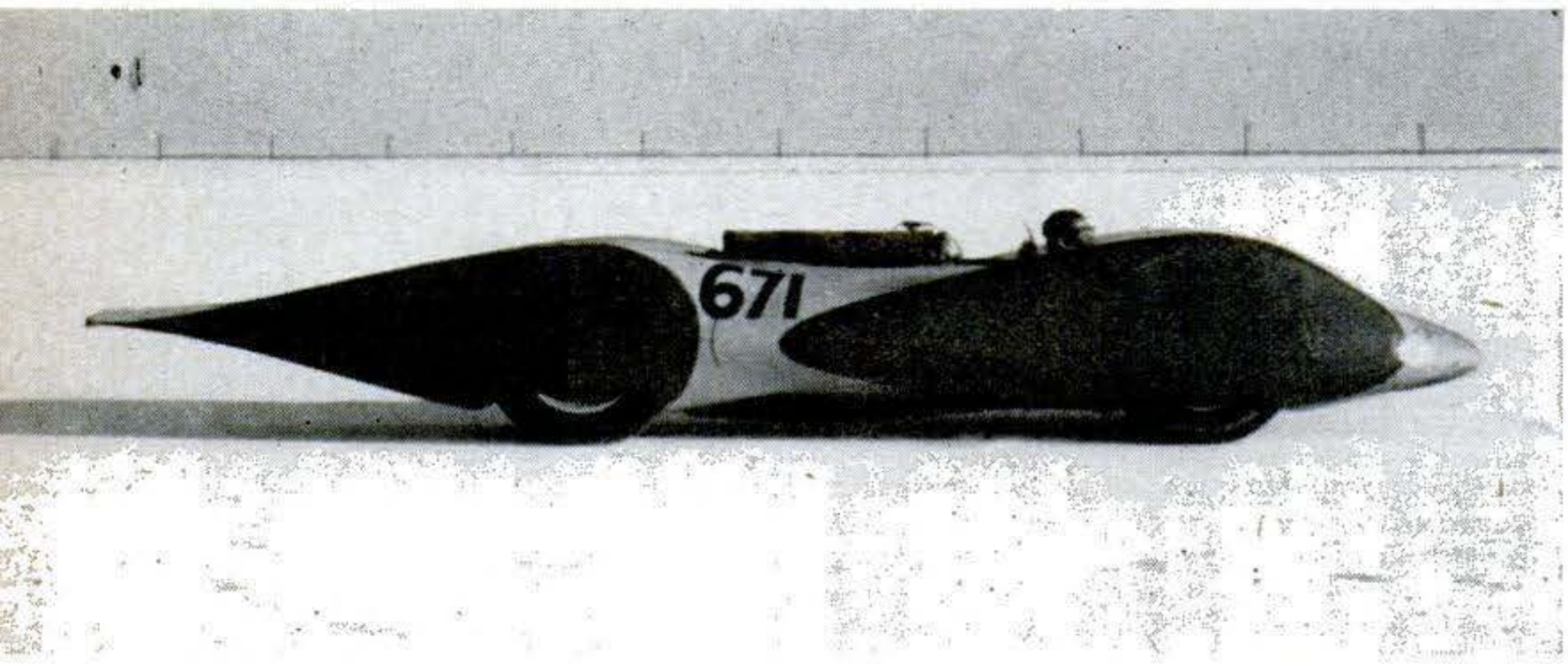
THE HOTTEST CAR



BUILT LIKE A BRIDGE, the Shadoff Special, winner of the fastest mile (236 m.p.h.), had frame tubing of stainless steel. Builder said it could roll over at 200 and not fly apart.

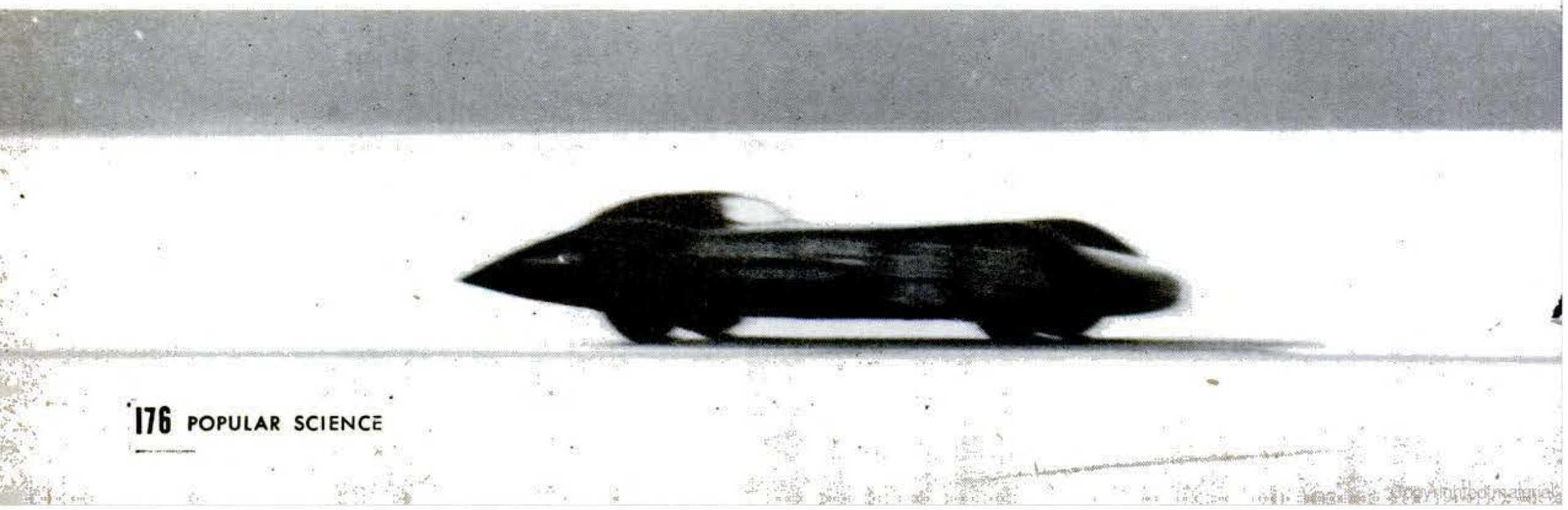
SUPERB ENGINEERING of the Shadoff Special, seen above before its body was lifted on, won its builder, Ray Brown, the Maramount gold trophy and a $1,000 college scholarship.

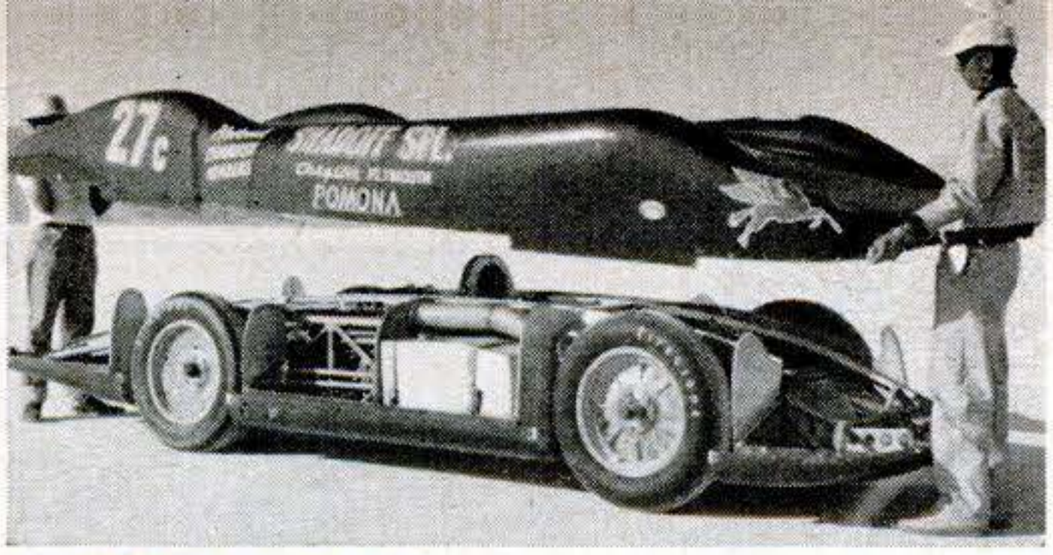
THE DIESEL



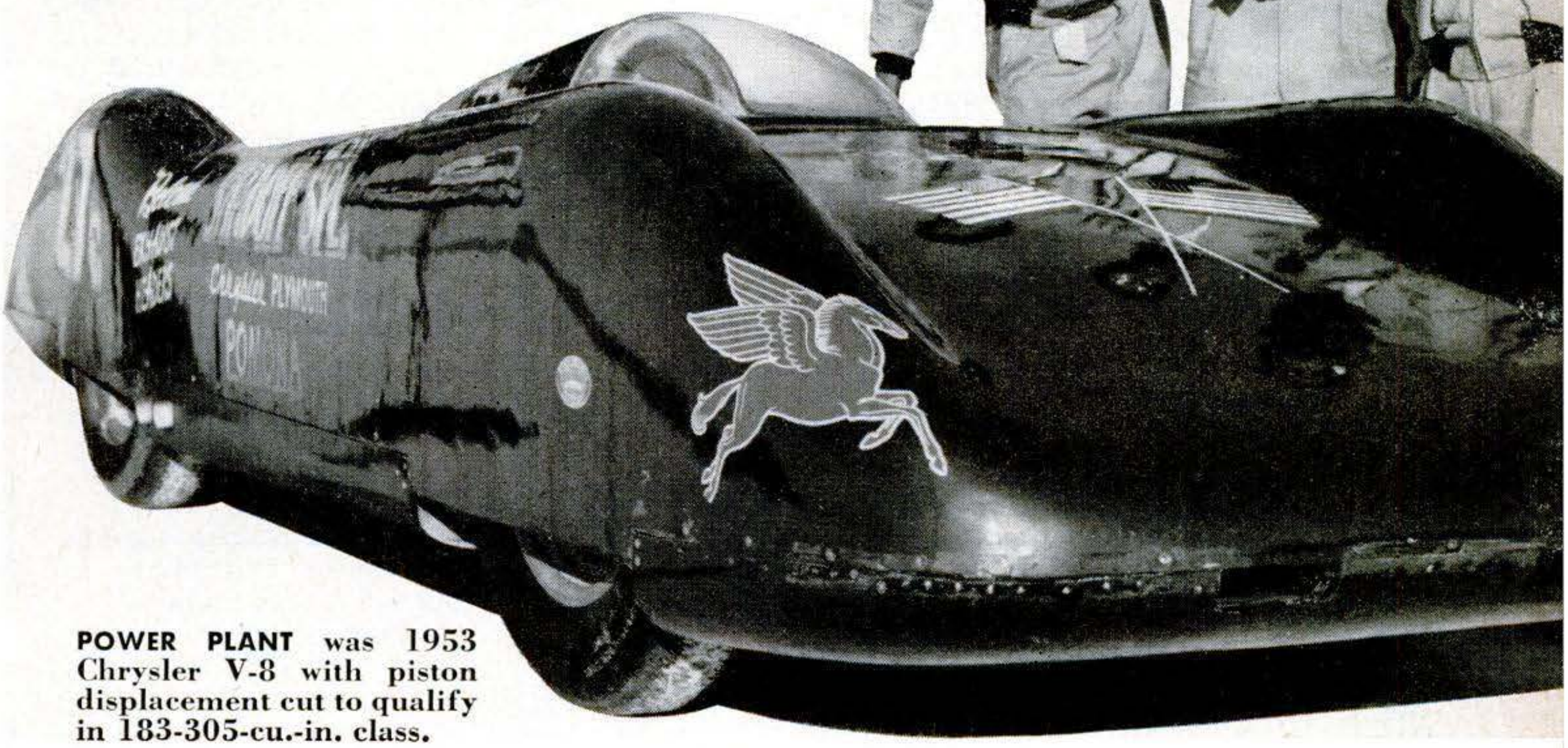
BUILT IN 18 DAYS, this odd-looking entry was the only diesel in the meet. With a hopped-up GMC 671 truck engine, it carried its builder, 26-year-old Dana Fuller, one kilometer at 171.80 m.p.h. His'54 goal: 200 m.p.h.

THE MERC





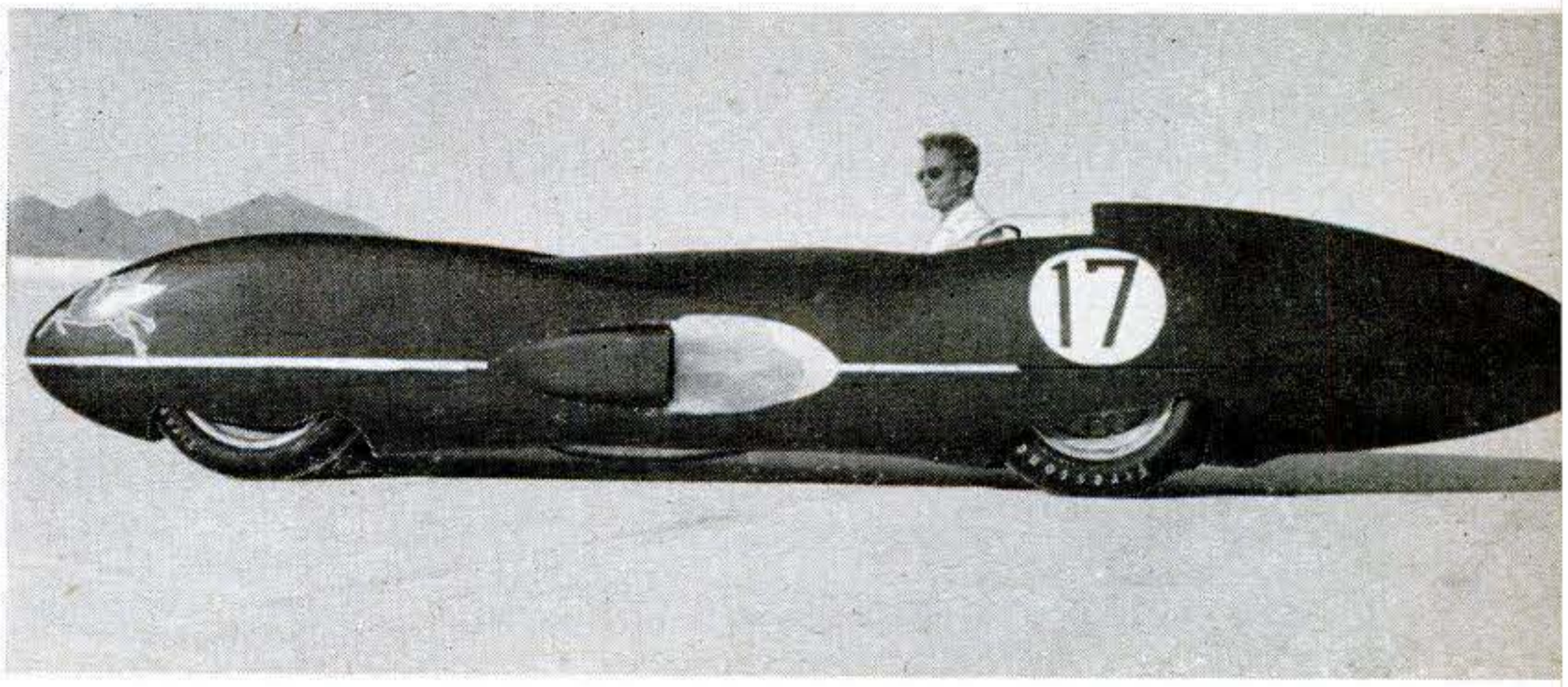
100-POUND BODY, in one piece, is easily placed over chassis, bringing the car's total weight to 1,800 pounds. At right, grinning proudly, are (l. to r.): Driver Mal Hooper, Builder Brown, Sponsor W. R. Shadoff.



POWER PLANT was 1953 Chrysler V-8 with piston displacement cut to qualify in 183-305-cu.-in. class.

THE ONE THAT CRASHED

AT 240 M.P.H., the highly promising No. 17, at right, went into a roll and was demolished. Its unlucky driver was then rushed to hospital. Car weighed 1,300 pounds, had a Chrysler V-8 of 368-cu.-in. displacement.



FIRST HOT ROD to run for official international records (not official until reviewed by the F.I.A. in Paris), Bob Estes' Mercury Special (left and below) set records at Bonneville in '52 but was beaten by a Chrysler in '53.

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P.S.

Last minute news & notes...

RADIOACTIVITY traveled far and wide when a student unwittingly stepped on a glass capsule holding 1/750 of an ounce of radium in a Navy damage-control classroom at San Francisco. It was picked up by students' skin and hair, their shoes and clothes, and their cars. An easily detectable trail of "hot" footprints led to the home of one student. Another made a radioactive outline of his body on a couch. No one was hurt but it was three months before the lab building could be used again.

CAN CAMELS TEACH HUMANS how to stand hot climates? Composed of researchers who think so, a Duke University expedition to the Sahara Desert is spending a year studying the animals, to learn how they thrive in a region where temperature soars beyond 140 degrees and years may pass without rainfall.

KING SOLOMON'S MINES will be operating again within two years. Modern mining methods will restore to production the 3,000-year-old copper workings of Biblical fame in southern Israel, says a government official.

POWER FROM THE EARTH may bring an industrial boom to New Zealand. Sinking deep bores in the geyser area of North Island, engineers find it has the highest underground steam pressure in the world. Harnessing the steam would yield electricity at less than one-tenth its cost from hydroelectric projects, a report of their study concludes.

UP-TO-DATE SPIES may resort to radioactive writing, Army investigators were recently warned by Capt. J. W. Osterburg, an expert on codes and ciphers. Secret messages using this kind of invisible ink would be read with a Geiger counter, instead of being made visible by chemicals.

"COLOSSATRON" is the name applied to a projected 15-billion-electron-volt atom smasher, which would be the most powerful in the world, in a report on its design. Applying a newly discovered "strong-focusing" principle, it would measure more than 300 feet in diameter. The Atomic Energy Commission is being asked to build it. Highly unofficial suggestions for naming its next two successors to the title of world's biggest: (1) the super-colossatron (2) The Thing.

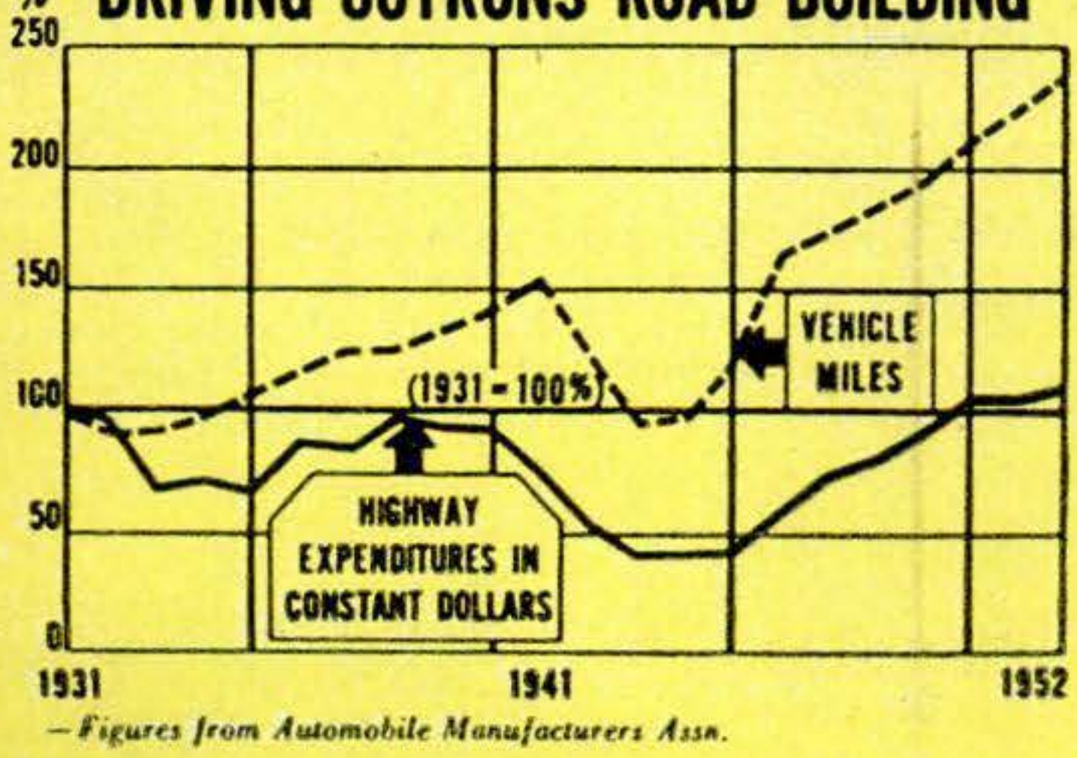
SUBSTITUTING DOUBLE DOTS for dashes would simplify sending and receiving and save up to 25 percent of current, in an improved radio and telegraph code proposed by a Marine Corps officer, Capt. Nils B. E. Forsberg. The letter A, which is .- in standard code, would be . .. in his.

THE WORLD'S BIGGEST TELESCOPE has an invaluable new accessory. An ultra-sensitive photometer enables Caltech's 200-inch "eye" at Mt. Palomar to detect stars and nebulas too faint to photograph.

RADIO SETS REMOTE-CONTROL SIGNALS and switches on a 90-mile single-track railroad, nearing completion in Venezuela to bring iron ore from the rich Cerro Bolivar mine to the coast for shipment to the U.S. By flicking levers, an operator at the port terminus safely maneuvers past each other on sidings two trains traveling in opposite directions, as incoming radio signals advise him of their progress.

The Editors

DRIVING OUTRUNS ROAD BUILDING



—Figures from Automobile Manufacturers Assn.

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The Best Christmas Toys You Can Build

How to make them is shown on the following six pages.

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By

Rowena M. Shoemaker

Asst. Dir., The Play Schools Association

Why These Toys Will Be Favorites for Years to Come

THE best toys are simple ones designed to suit children—not adults who make or buy them. That is one big lesson I have learned in 14 years with the Play Schools Association, which supervises the play of thousands of children a year at settlements, hospitals, orphanages and organized play schools throughout the country.

The five pieces of play equipment you see on these pages are simple. Deceptively so, for time and care are needed in making them.

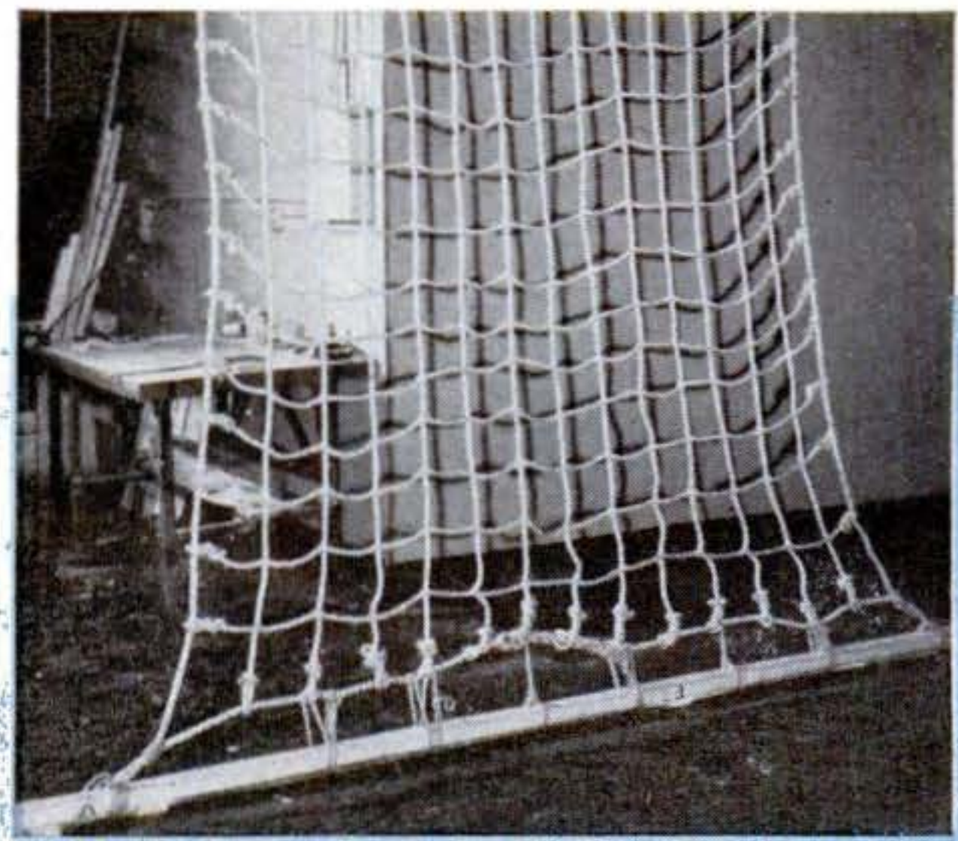
They are rugged, able to take the murderous punishment of a whole family of children. That is important. Shoddy construction is plain dangerous; children need equipment they can safely bang on, jump on and throw around.

Use No Nails

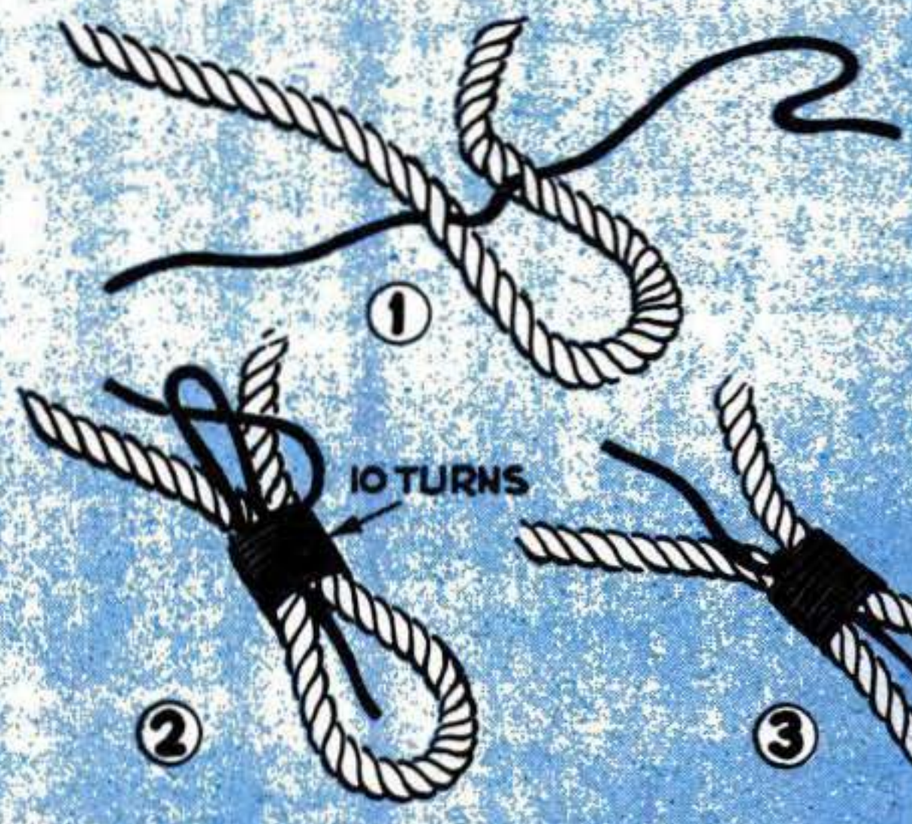
Preferably all wooden parts should be hard maple, which is almost splinterproof. Since maple is not easily obtainable in the needed sizes, clear white pine was used instead (except for the blocks which, offering the greatest splinter hazard, are maple). A great deal of effort was spent in sanding all surfaces perfectly smooth, rounding corners and edges, and countersinking screws. No nails should be used anywhere. The wooden toys—except the blocks—should be finished with tough varnish or enamel.

[Continued on page 264]

Cargo Net Lets Them



ABOUT $25 WORTH OF ROPE goes into the net—400 feet of ½" diameter and 50 feet of ¾". Sixteen horizontal lengths and 13 verticals are woven into the 8'-by-10' frame of ¾" rope.



2 CORNER LOOPS are formed with heavy twine. Twine is woven through strands of rope (top), then eye is formed with short end (lower left). Twine is wrapped around rope 10 times, then inserted into eye, which is pulled tight under wrapping (right).

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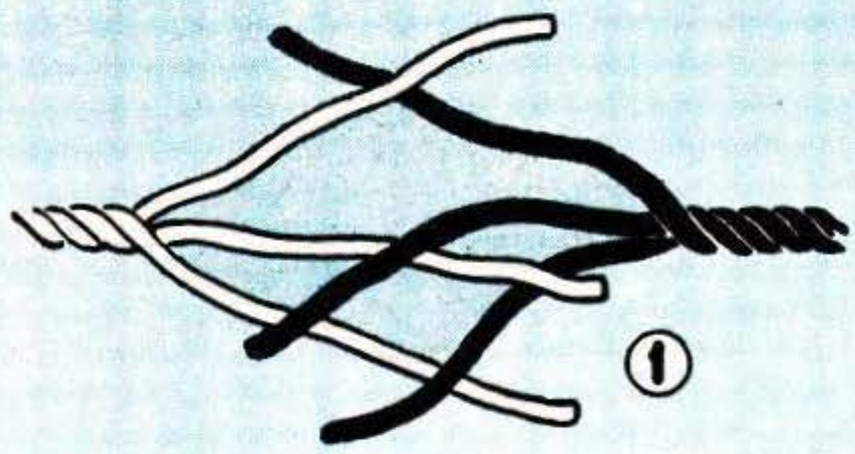
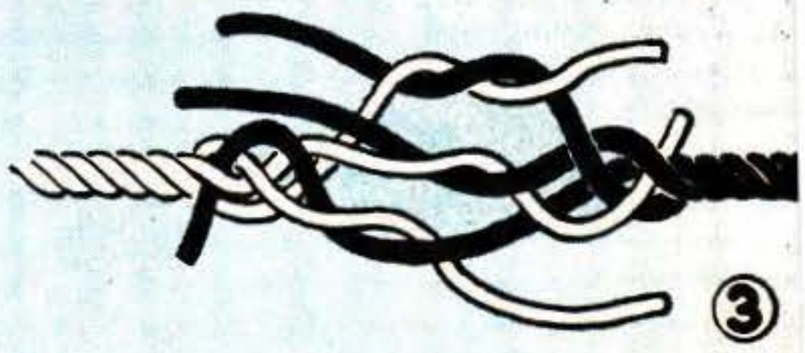
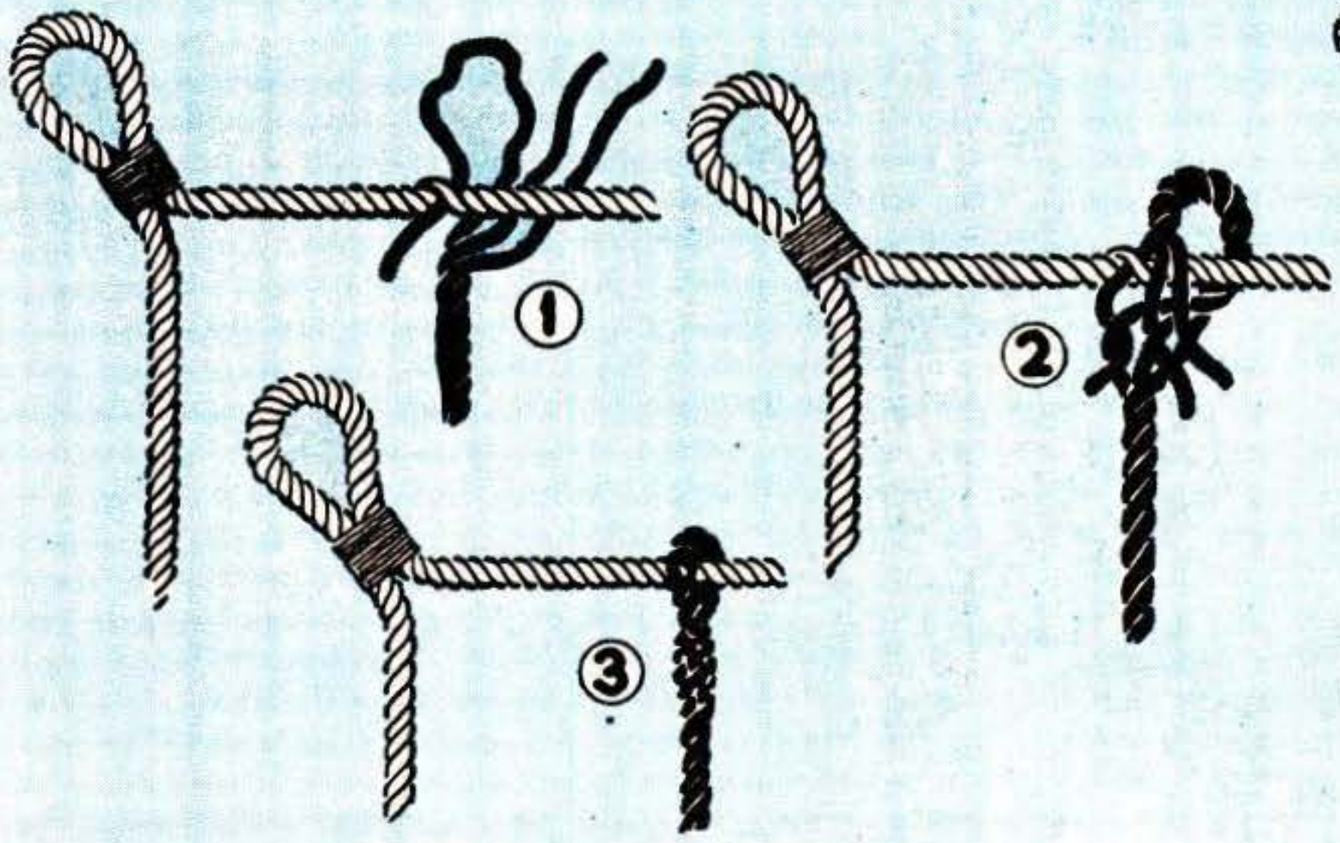
Climb and Jump Safely

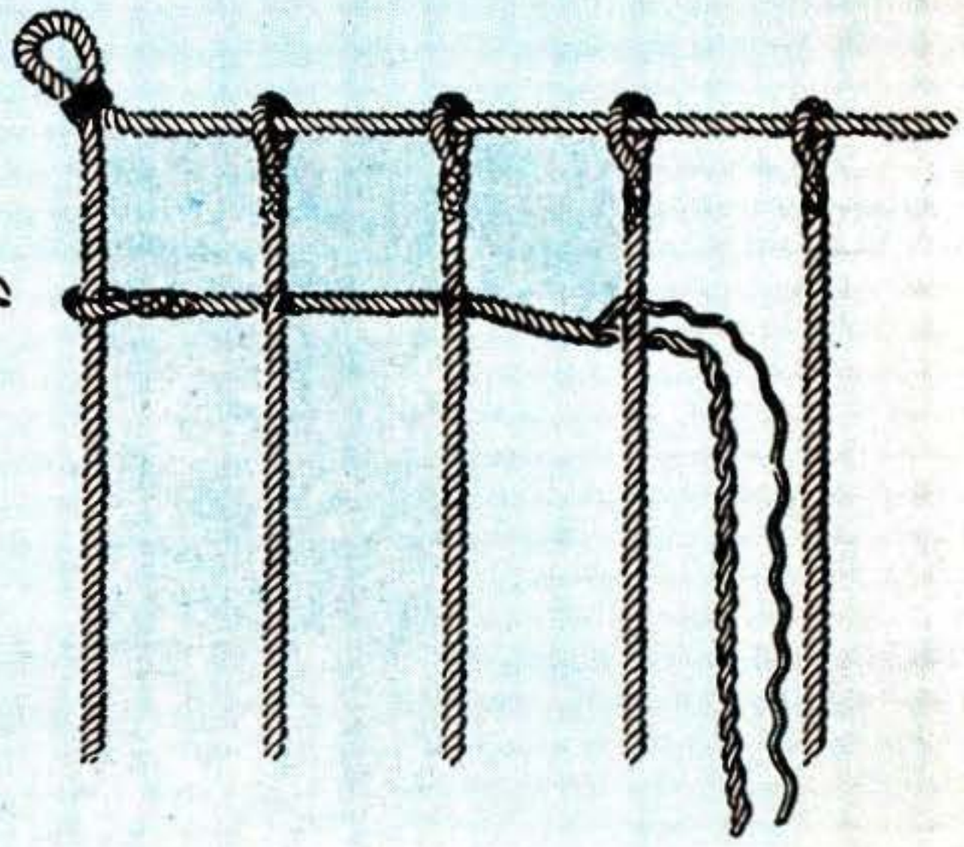
Hang this net from the basement ceiling joists and turn them loose. They'll climb for hours.





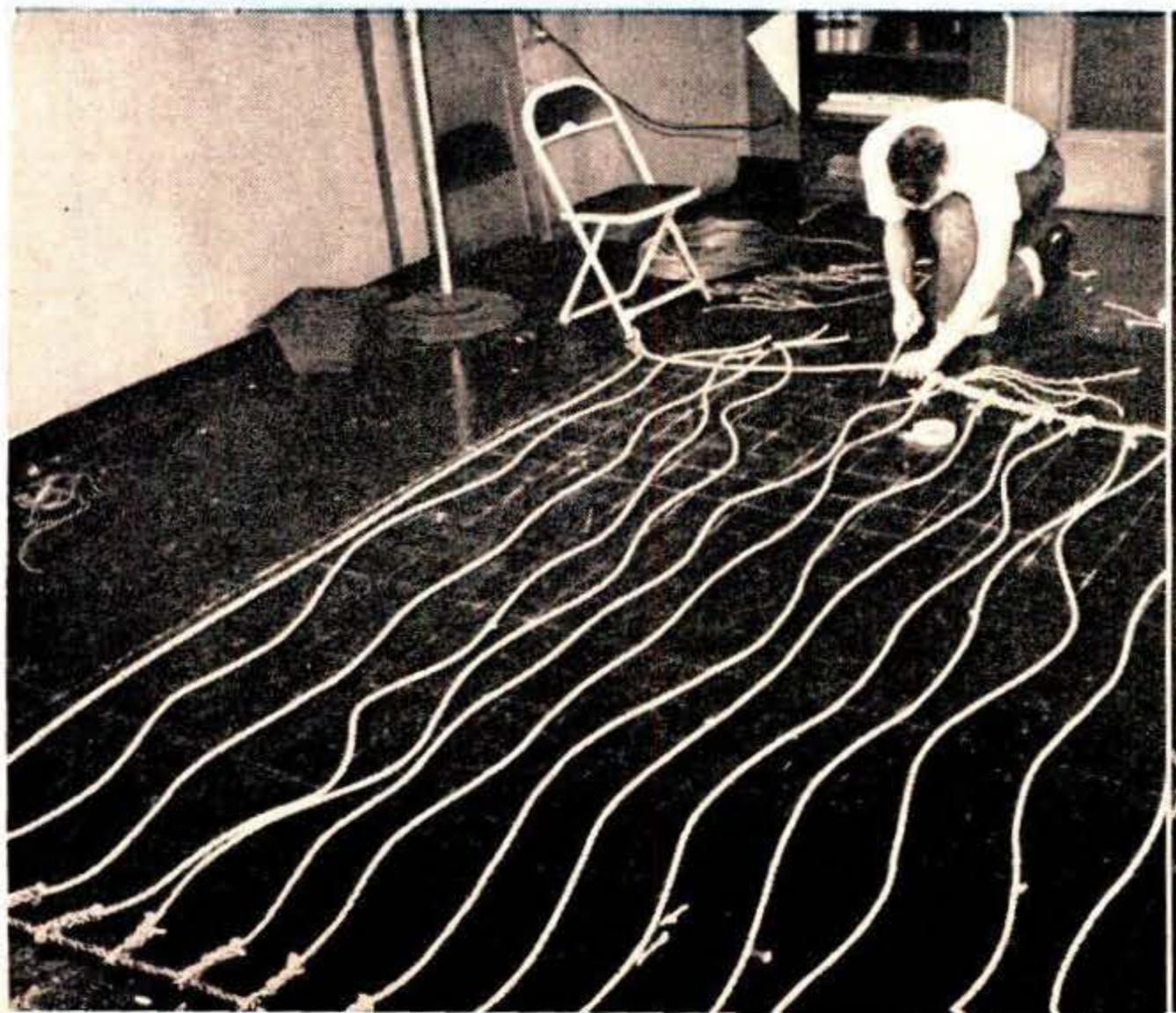
1 FRAME is laid down on squares chalked on floor. Rubber bands hold corner loops while splice is made at bottom center. Strands are unlaid and brought together (left), opposite strands are joined by overhand knot (center), then woven into rope body (right).





3 VERTICALS are spliced to frame first, using eye splice. Strand of eye is tucked between strands of frame (top left). Three loose strands are tucked into body of vertical to form eye (right), then woven into strands (bottom left) as in step 1.

4 HORIZONTAL ROPES are spliced to frame with eye splice. Rope is cut to 10′ length and one strand is unlaid for full length. This strand is tucked into strand of vertical, rewrapped about 6″ then tucked into next vertical. Stick (below) maintains spacing.



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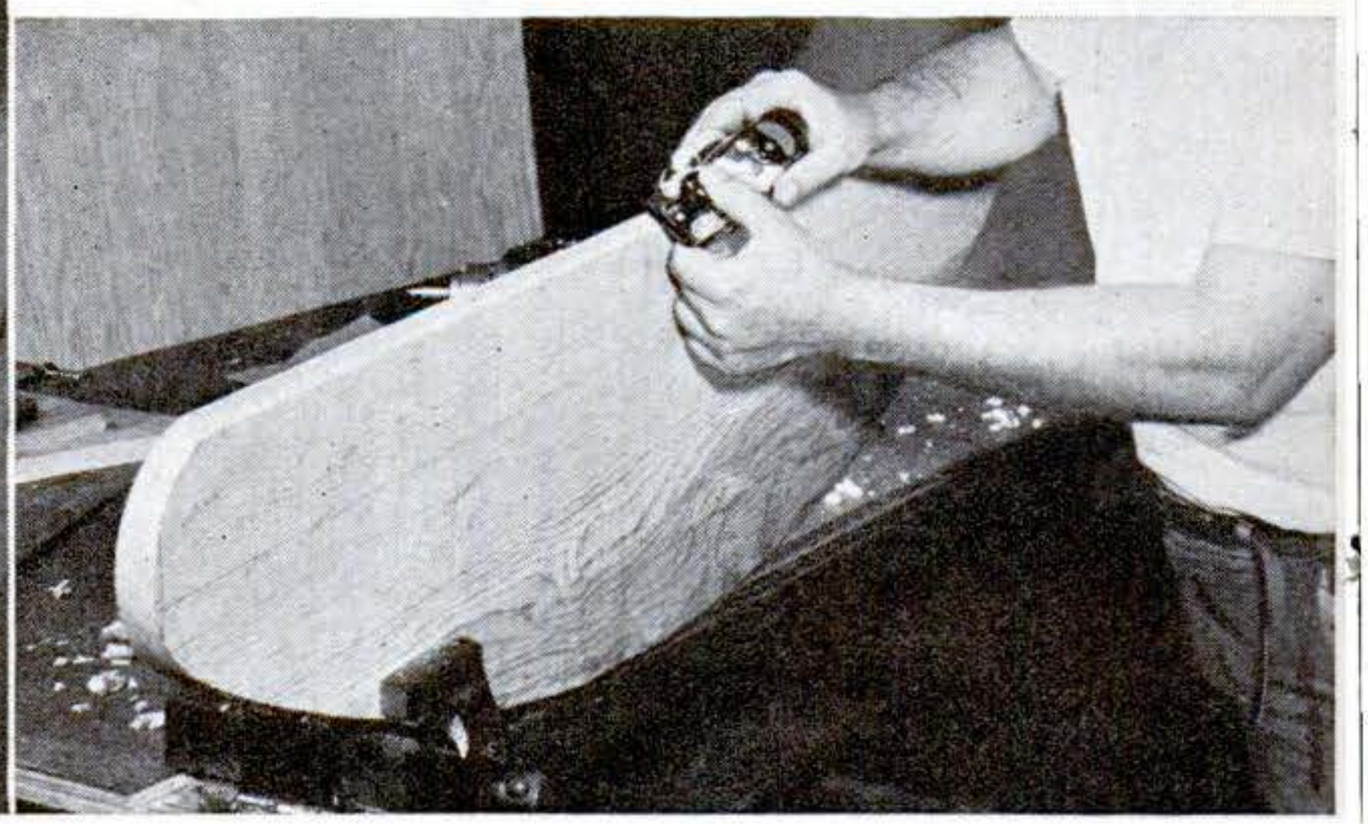
Rocking Boat Is Also Practice Stairway

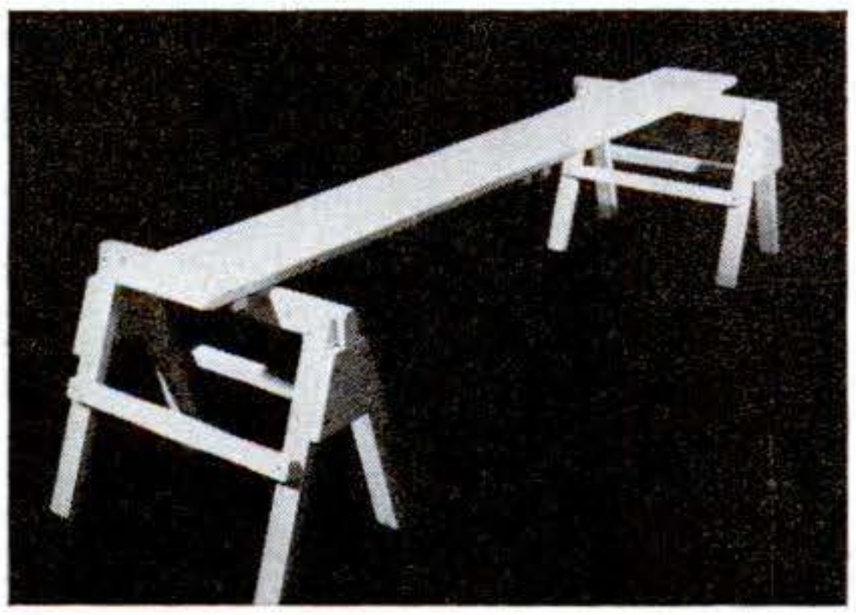
Used as a rocking boat, it is filled with fun. Turned over, the toddlers can safely practice the serious business of going up and down steps.



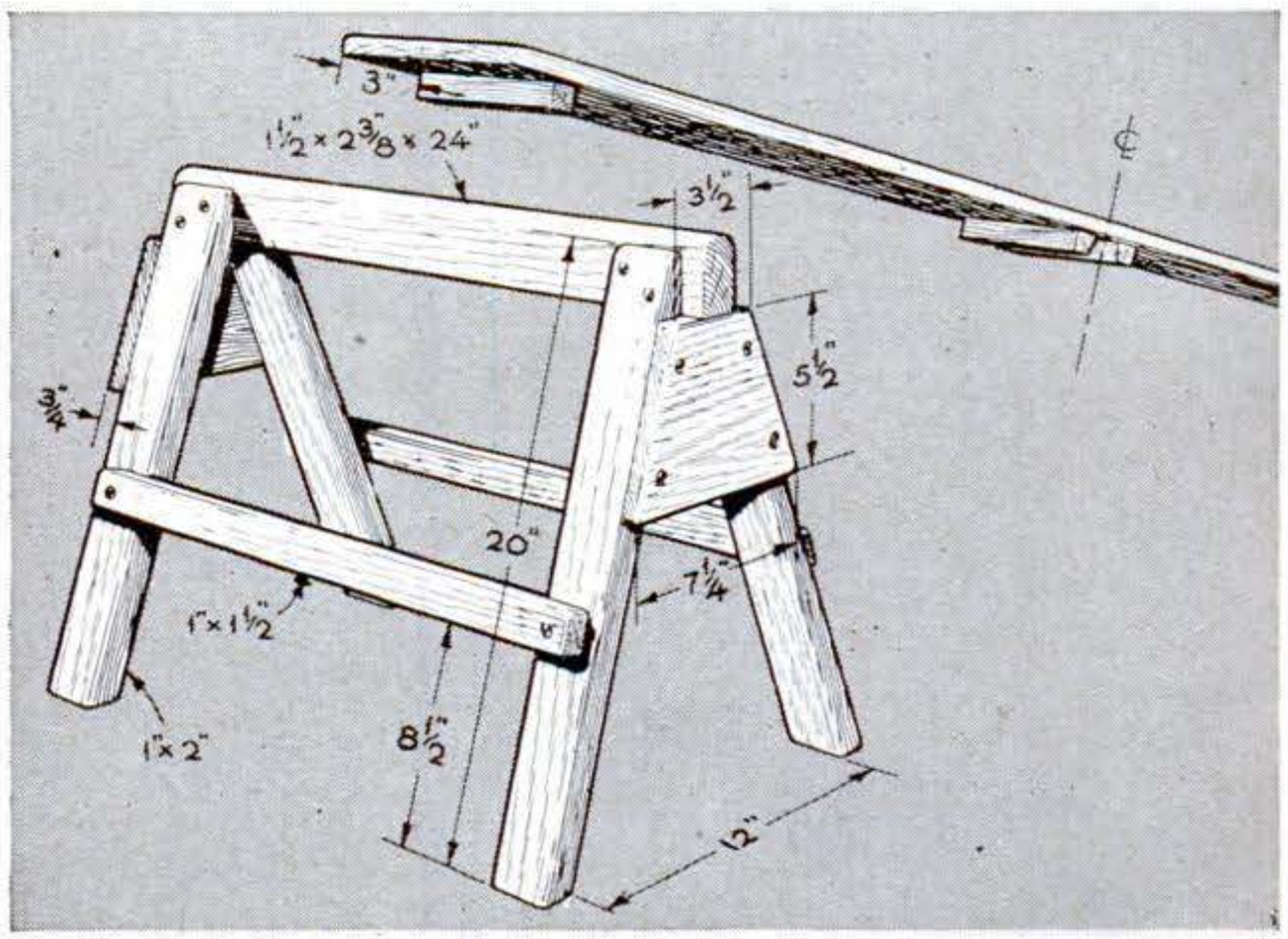
2 COMPASS SAW cuts the curved sides with ease. Rounded ends must be cut with coping saw as the radius is tighter. Cutting close to line will save planing later. Clamps hold the board firmly in place on your bench top —and let you concentrate on cutting the wood.

3 REMOVE SHARP CORNERS. There should be no sharp corners or edges on any children's toys. Remove them by planing a heavy chamfer on each side, then sanding round and smooth. Smooth flat surfaces at this time, using open-coated paper for fast sanding.

Plank, Two Sawhorses Make Triple-Play Toy



One horse and the plank are a seesaw; two horses support plank for walking—and the horses are horses.



SEESAW unbalances the budget about $9 worth. Two sawhorses take 16′ of 1¼″ by 2″ for legs, 8′ of 1¼″ by 1½″ for side braces, 3′ of 1″ by 6″ for end braces or gussets, 4′ of 2″ by 3″ for crossbeams, 7′ of very clear 1¼″ by 10″ for seesaw plank.

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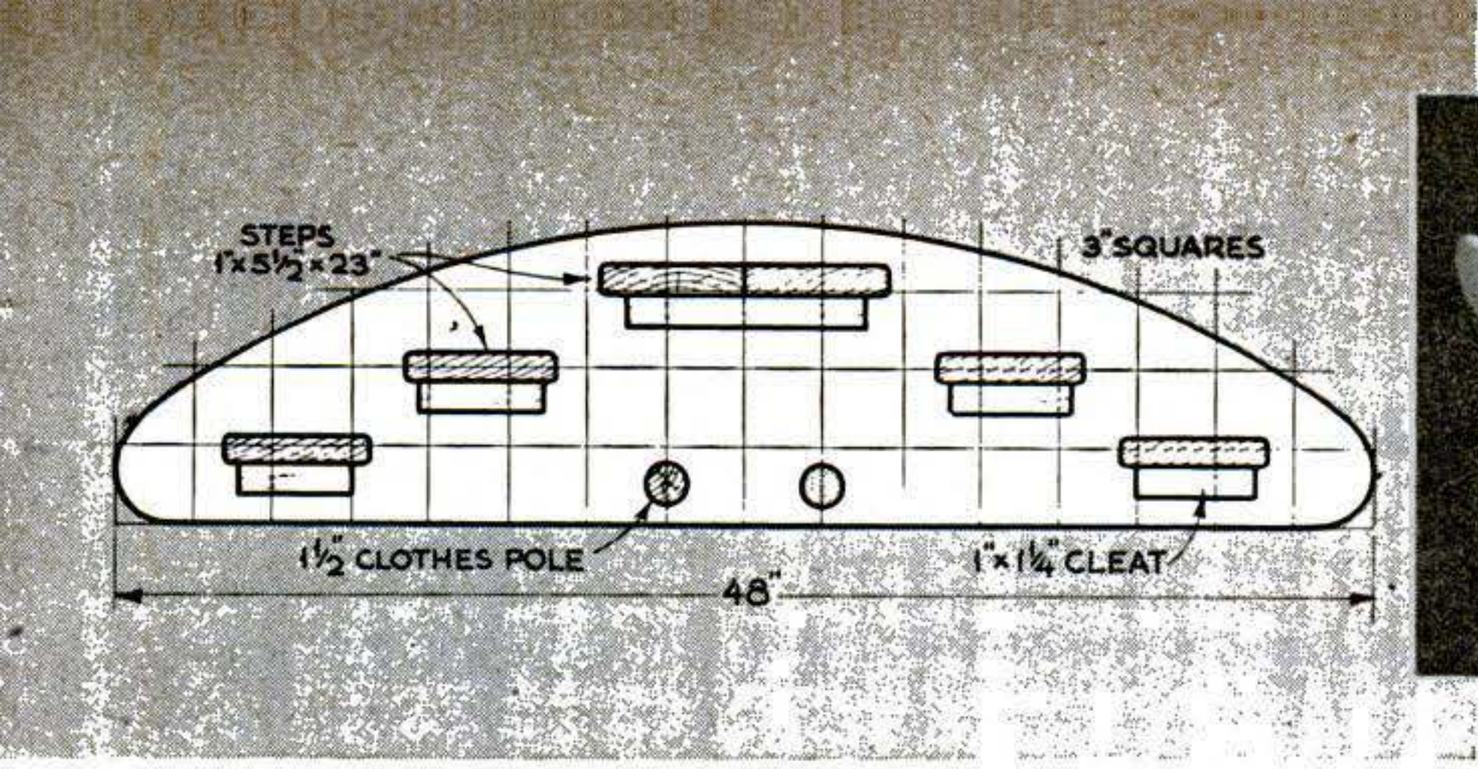
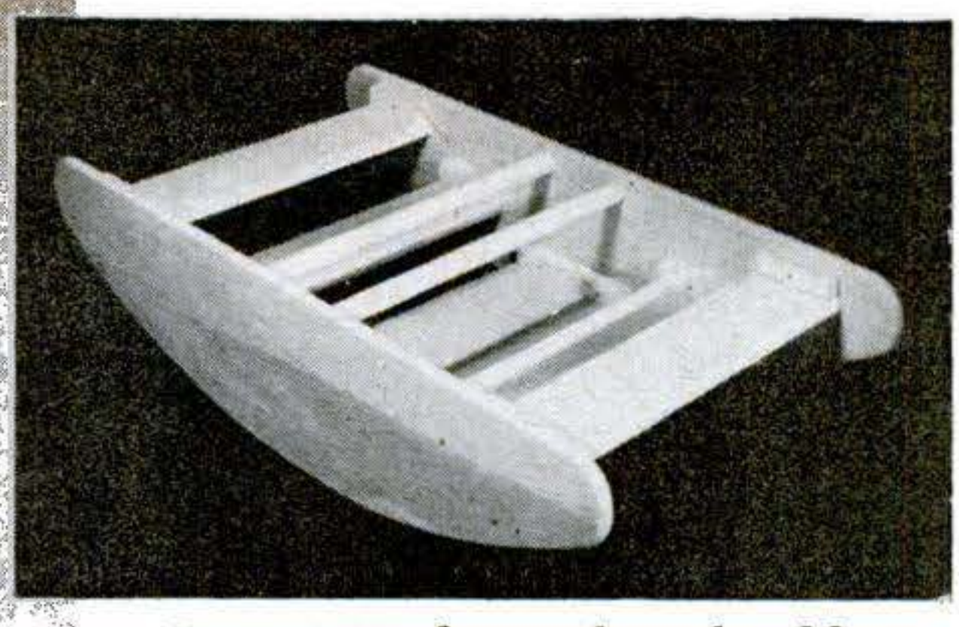
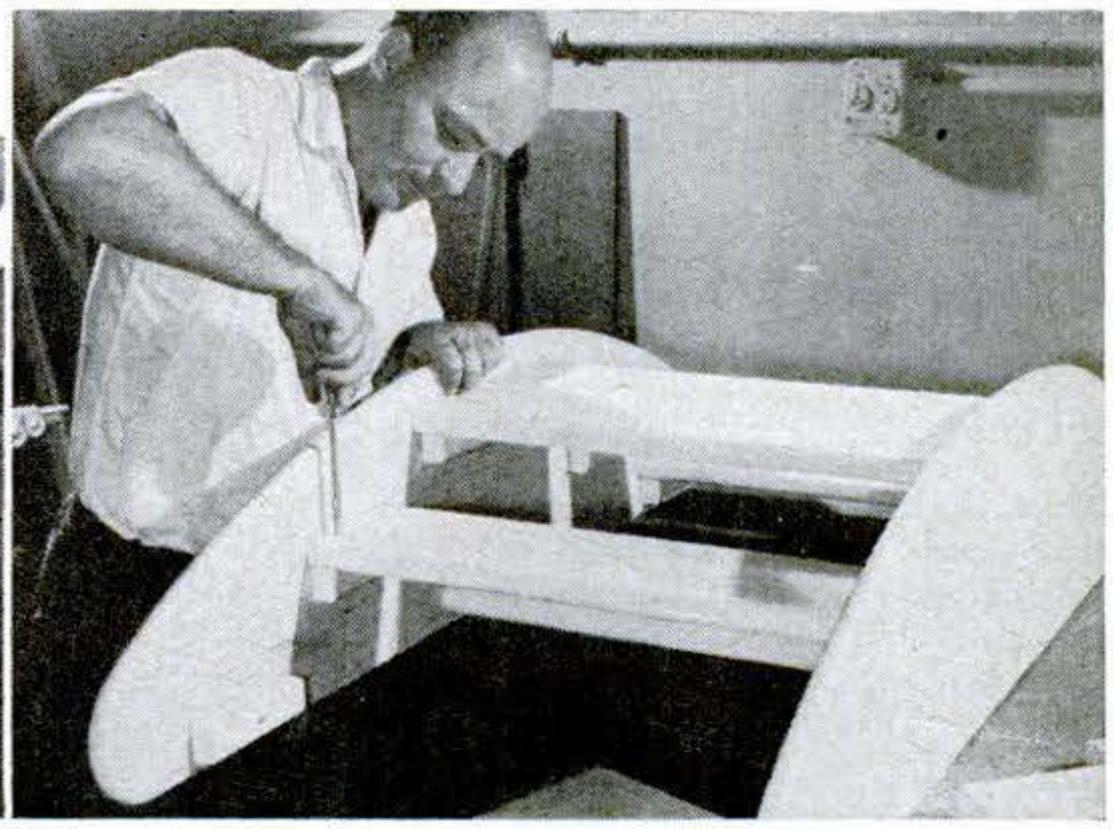




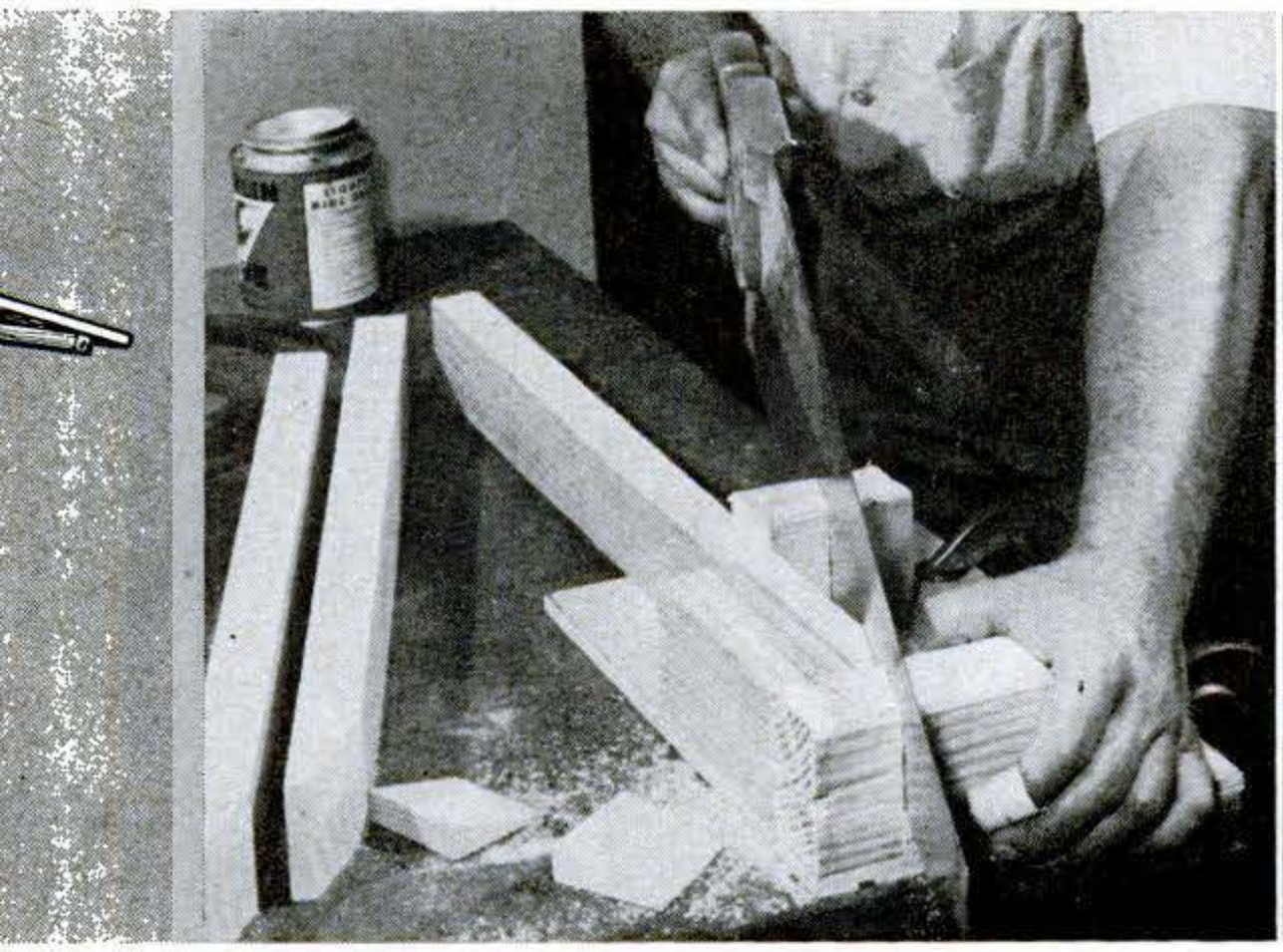
1 LAY OUT 3" SQUARES on 4′ length of 12″-wide board and draw in outline of side and location of seats and holes for hand bars. A coffee can is just about the right diameter for drawing the round ends.

CLEAR PINE for rocker should cost less than $8. You'll need 12′ of 1¼″ by 6″ pine for seats, 8′ of 1″ by 12″ for the sides, 6′ of 1″ by 1½″ for cleats, and 4′ of 1½″ clothes pole.

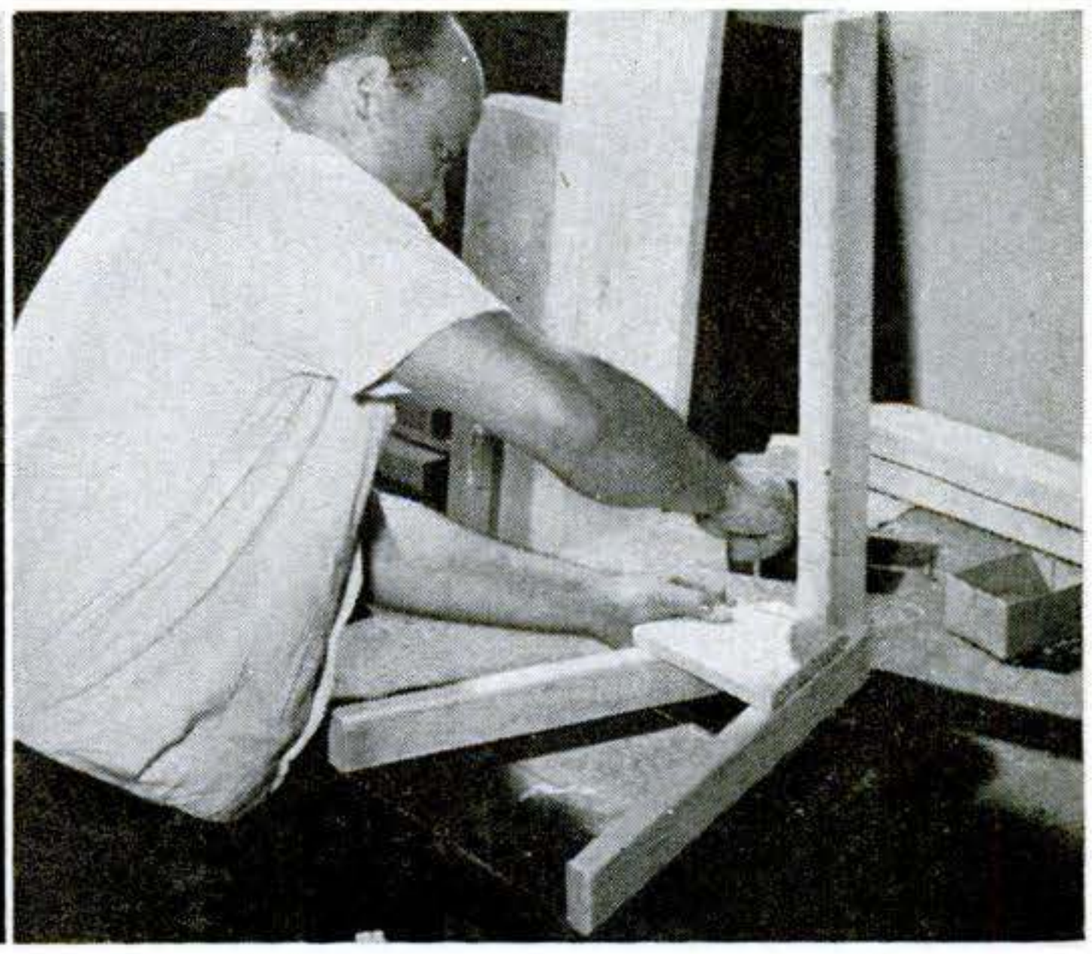
4 DEPTH GAUGE, made from a short piece of clothes pole, checks depth of hand-grip holes. These are made with expansive bit. Drill test holes in scrap first to be sure the bit is adjusted correctly. Cleats are glued to sides, a single wood screw serving as a clamp.



5 FINAL ASSEMBLY. Insert clothes poles in holes and join sides with seats screwed to cleats. Note that in this position the rocker becomes a short set of practice steps. Toddlers can climb up and down—a favorite pastime—without danger of bad falls.



1 SAWING JIG helps cut uniform bevels on leg ends. Mark angles on one leg and cut it and the jig together. Other legs will come out the same, as saw will follow original cut in jig. Rough surface of saw cut can be smoothed by a few quick strokes of hand plane.



2 LAYOUT DRAWN ON BENCH TOP helps set up legs. Crossbeam, rounded and smoothed, is stood on end and legs put in place on layout. Gussets are screwed to legs laid flat, then leg assemblies are screwed to crossbeam. Cross braces complete horses.

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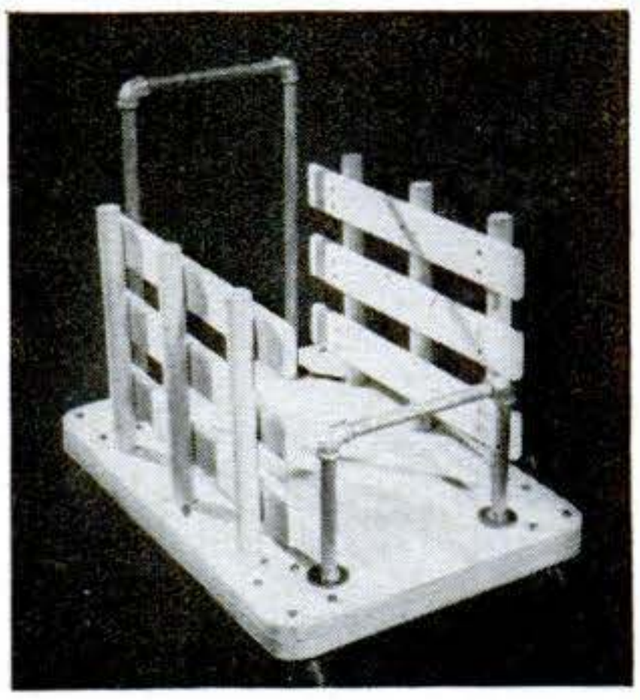
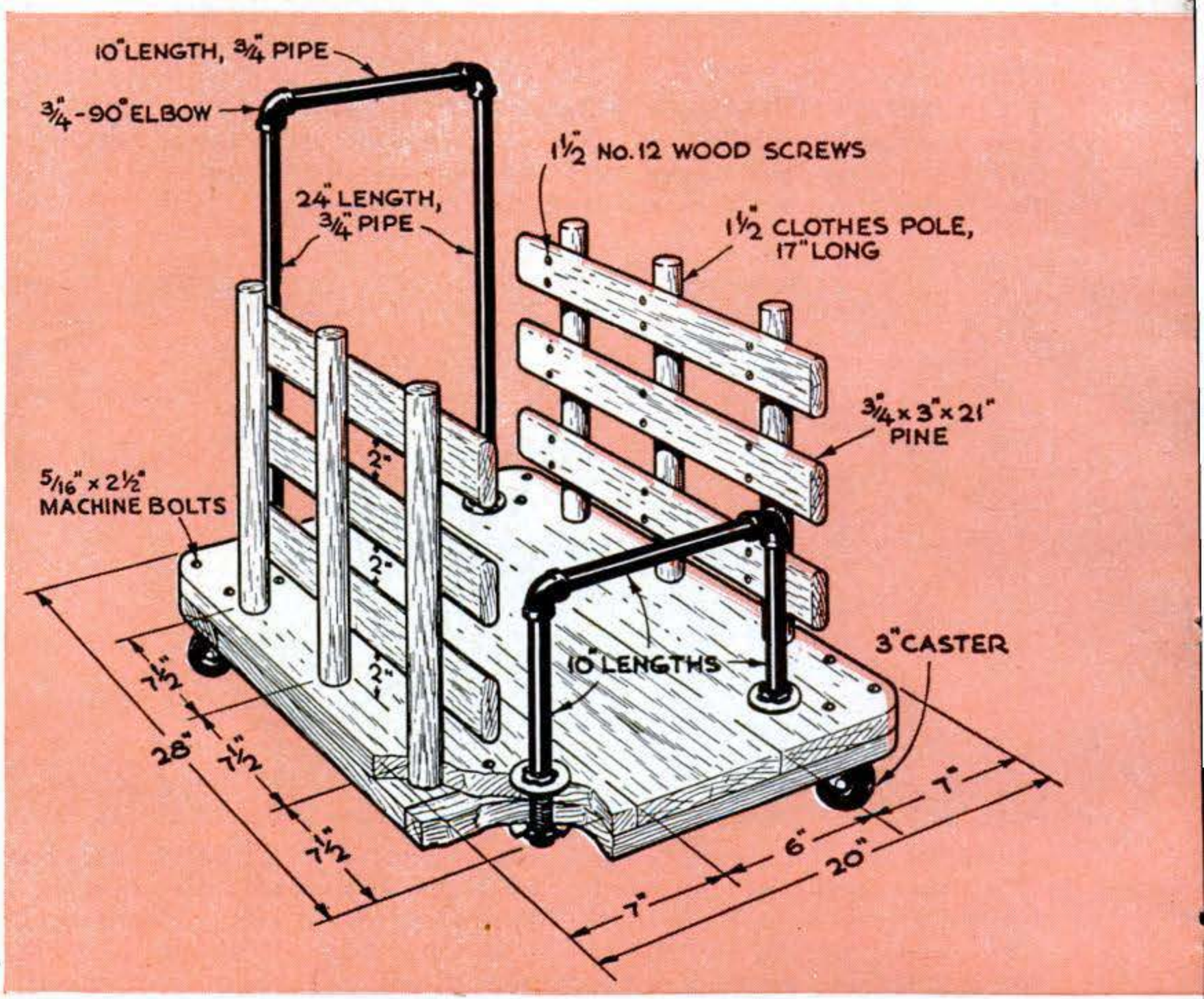
Expressman's Hand Truck Brings Fun on Delivery

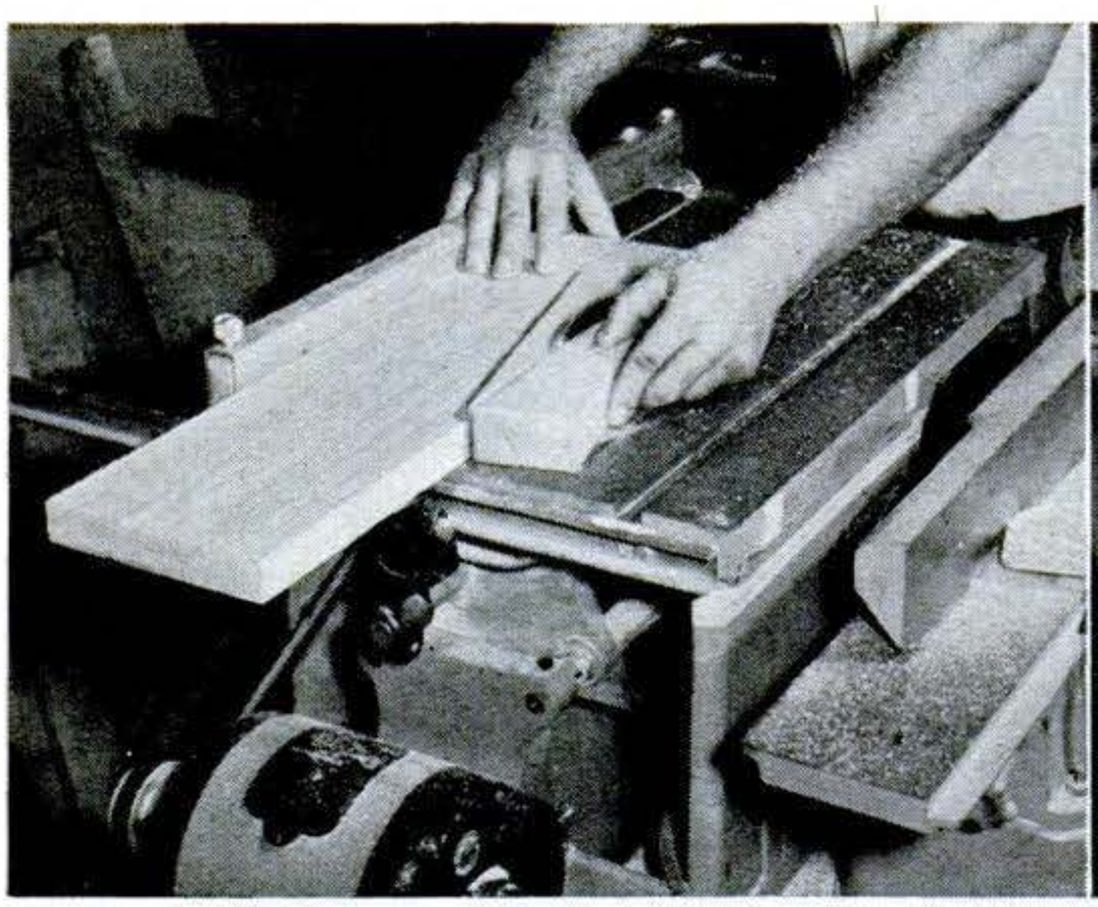
Designed to store and haul building blocks shown on bottom of pages, this hand truck will probably see more service hauling kids.



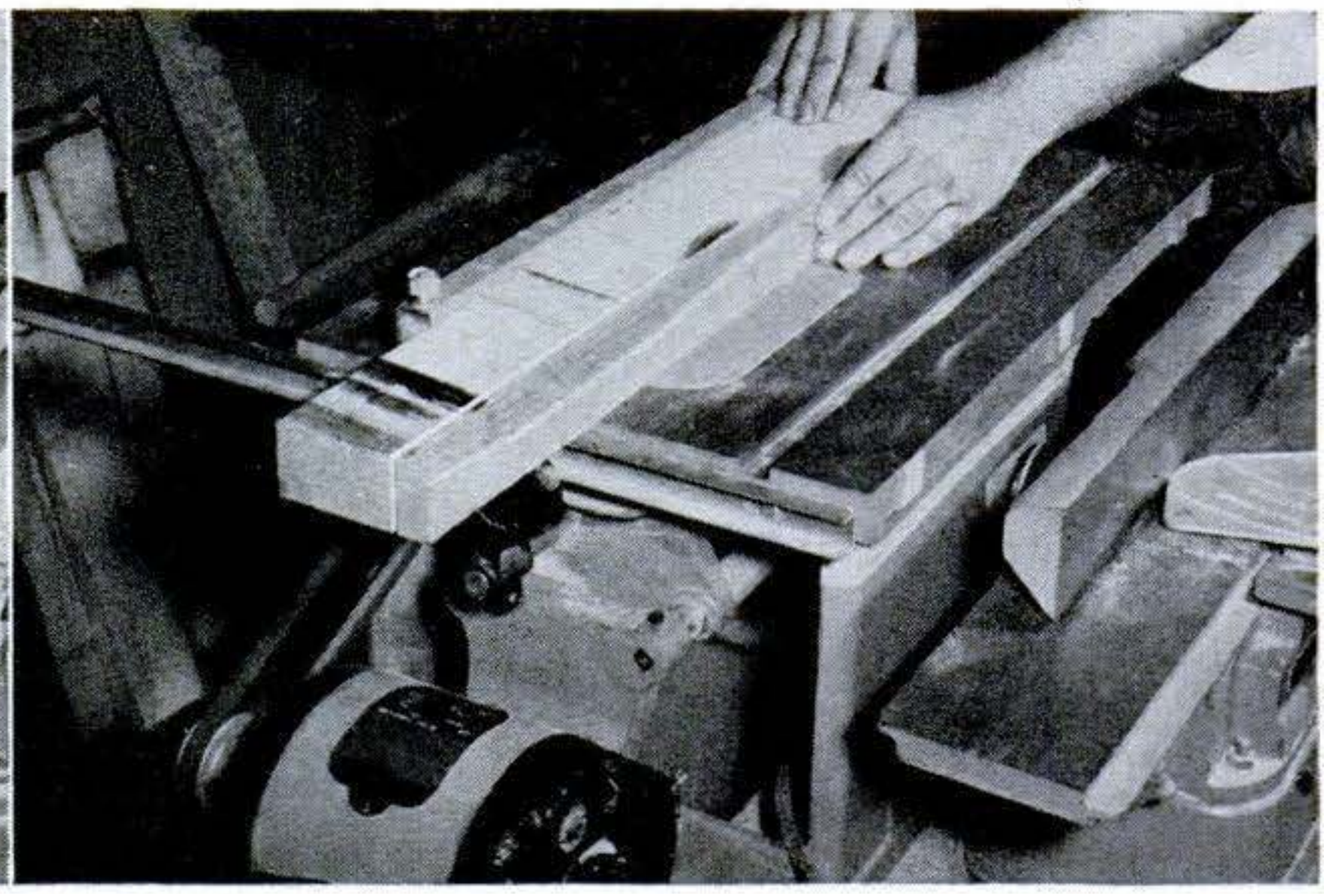
HAND TRUCK will take you for a $23 ride. Casters at $9 a set of four are biggest item. Pipe nipples and fittings are next biggest at $6.50. Balance goes into lumber—14′ of 1¼″ by 7″ for double-thickness base; 9′ of 1½″ clothes pole for side stakes, and 12′ of 1″ by 3″ for side slats. Cutaway view of truck corner (right) shows method of setting pipe in base.



The Right Building Blocks Interest All Ages—



1 MAPLE IS BEST MATERIAL—no other wood will take the punishment without splintering. Cut board into strips 1⅜″ thick by 2¾″ wide, then cut units off strips. Blocks should be sanded smooth and corners rounded off with a few strokes of hand plane.



2 LONG ANGLES are cut with jig made from scrap board. Shape of angle block is cut with handsaw; stock placed in cutout and fed into saw will be proper shape. Triangles are cut with miter head set at 45°. Pillar is half the width and same thickness as unit.

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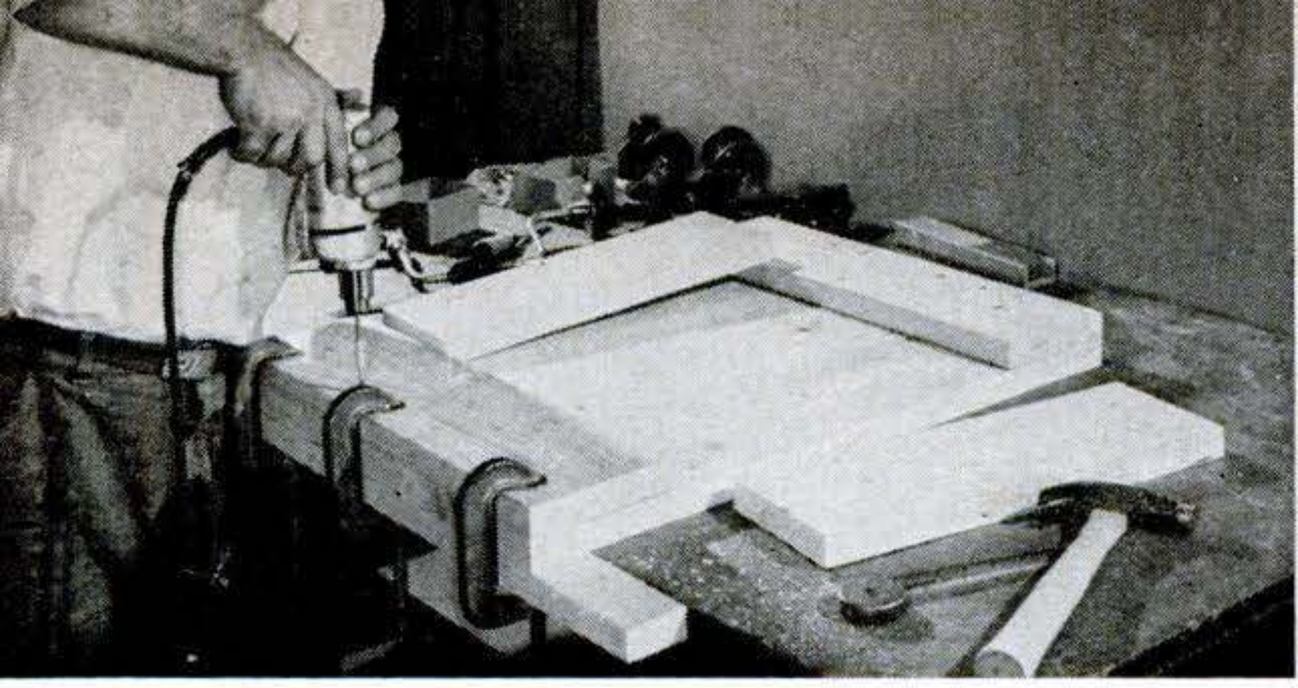
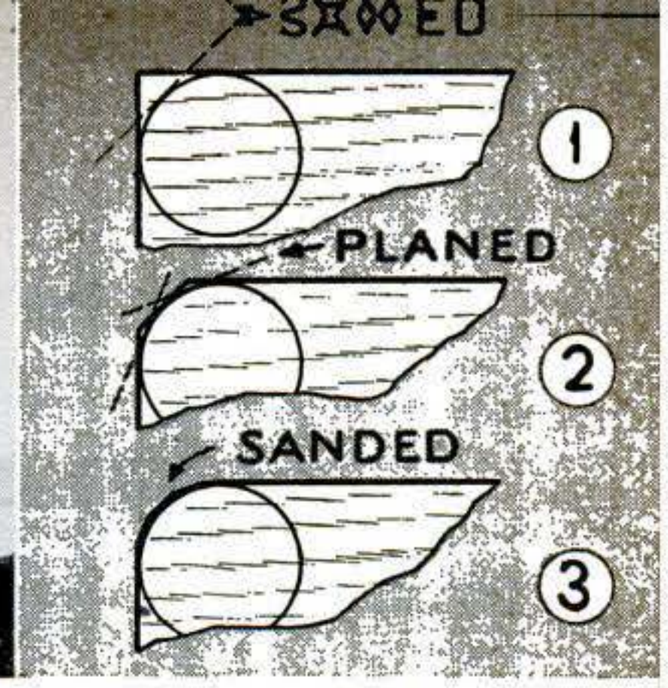
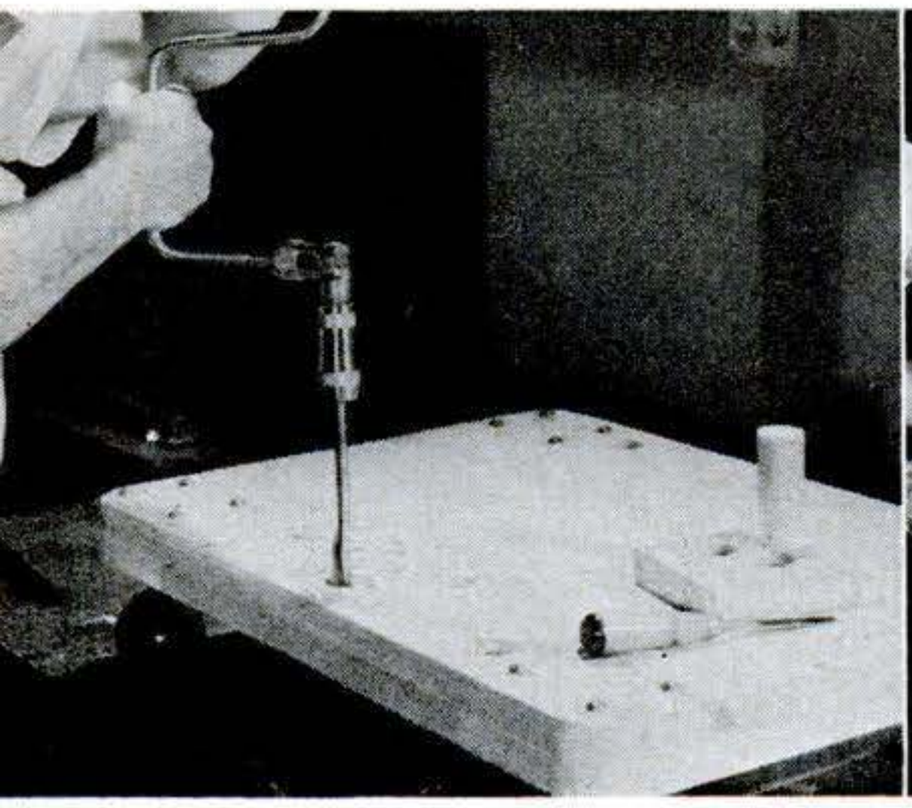


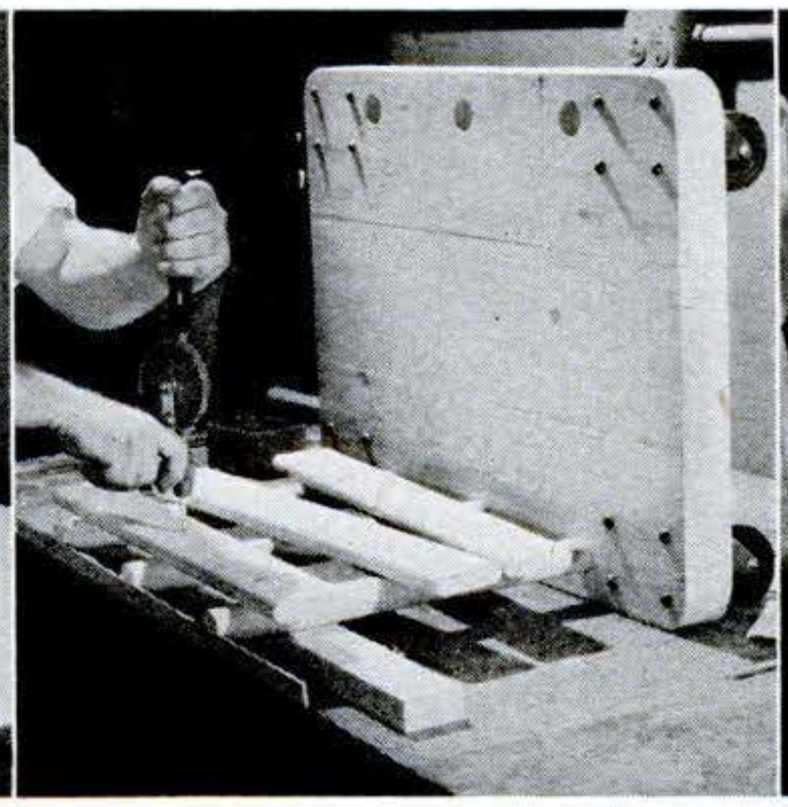
1 BASE OF TRUCK is built in two layers: top layer (shown face down) is three boards planed to fit nicely side by side; bottom layer is simple frame to brace and hold top boards together. Clamps hold pieces while screws are driven.



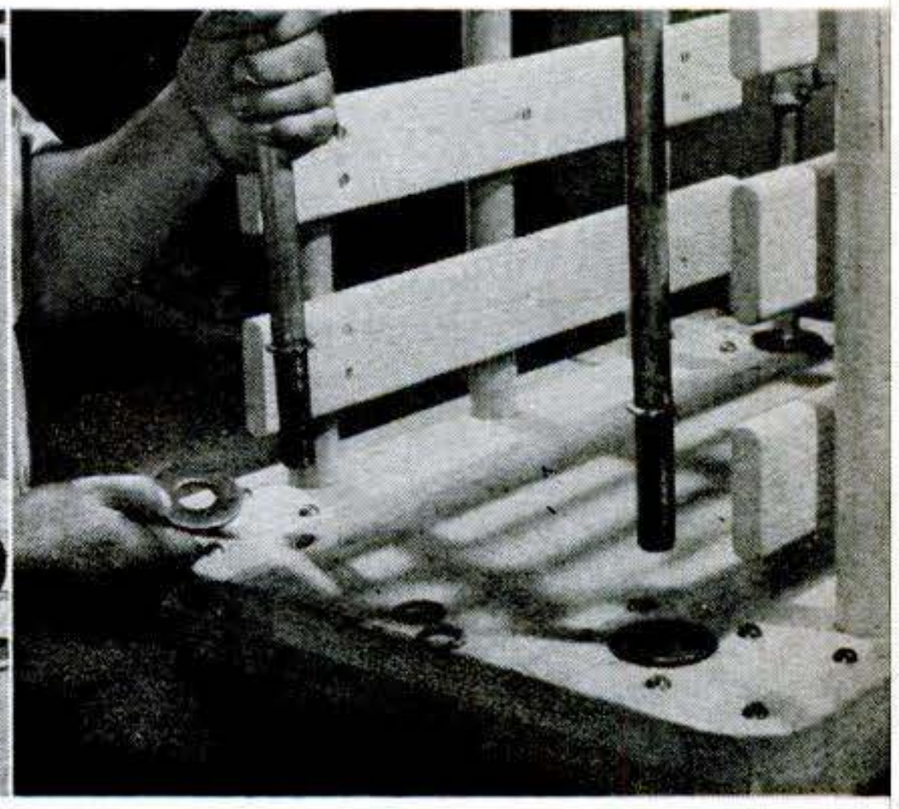
2 CORNERS ARE ROUNDED using can of about 3″ diameter to draw in radius. Drawing at right shows method of rounding a corner: 1. Saw off corner at 45° angle; 2. plane off two shallow corners left after sawing; 3. finish with coarse sandpaper, smooth with fine.



3 HOLES FOR STAKES are bored with expansive bit. Set bit to cut loose-fitting hole. Bore through top board only; leave bottom intact to support stakes.



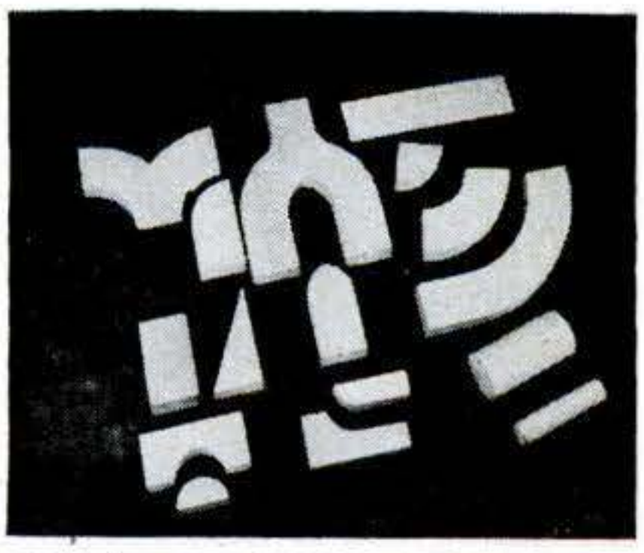
4 SLATS are screwed to stakes, using holes in base and spacing stick to keep alignment. Bottom slat is 2″ above base; others are spaced 2″ apart.



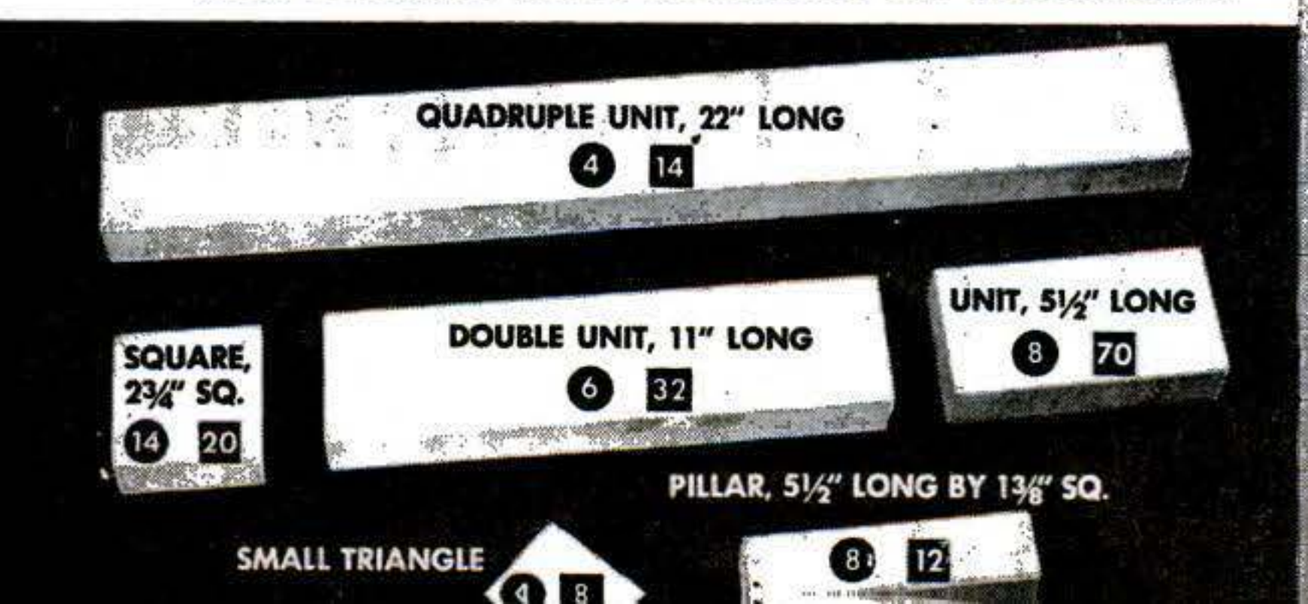
5 PIPE-NIPPLE HANDLES are set in holes drilled through base. Lock nuts and washers hold handles rigid. Have bottom ends of pipe threaded about 2½″.

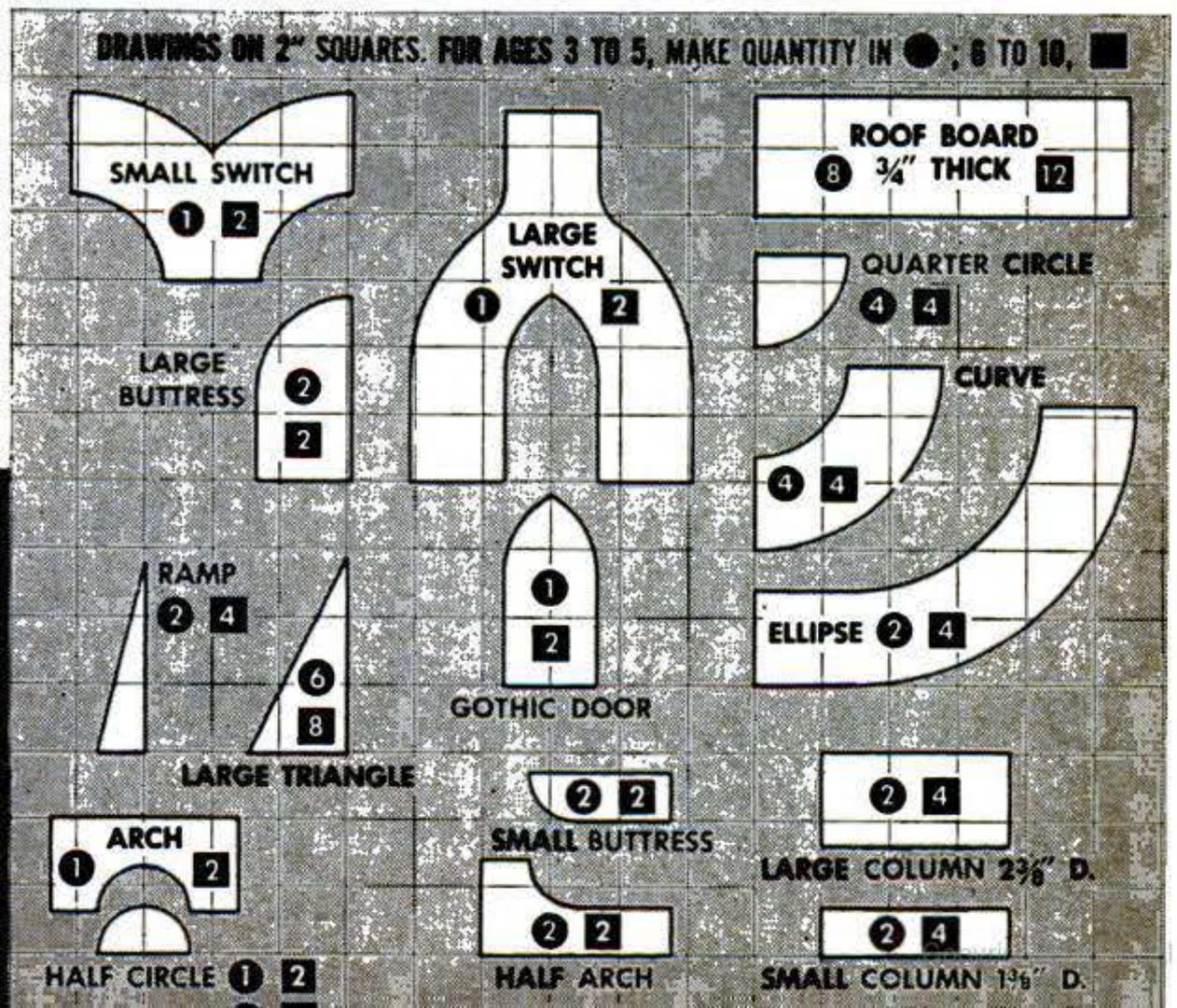
This Set Can Grow with a Child

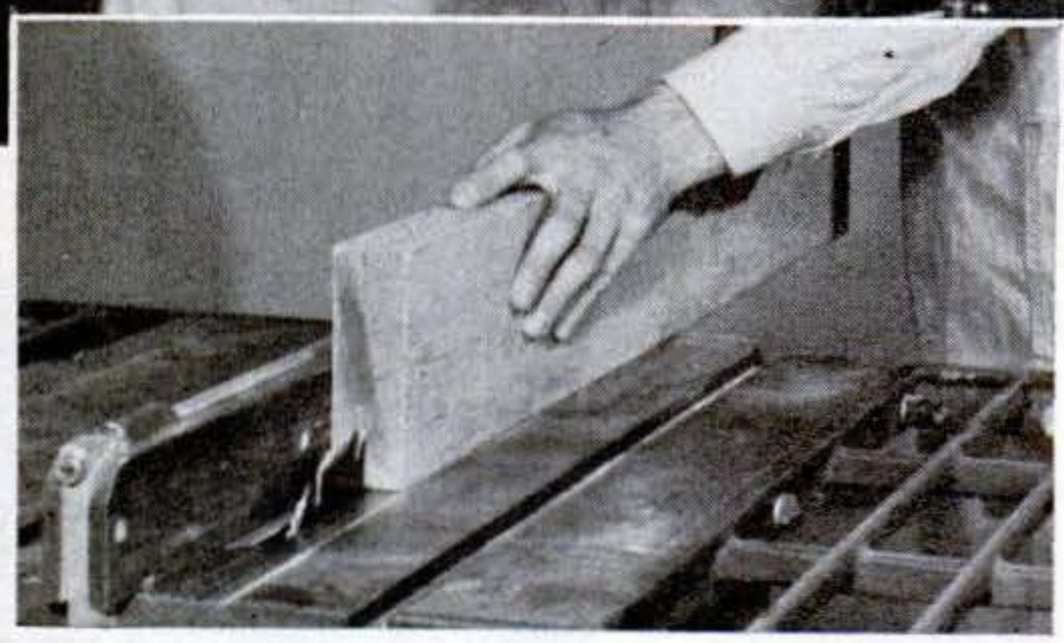
For quiet, constructive play, nothing equals a good set of building blocks designed to encourage a child's imagination and creative ability.



BASIC SET FOR TWO-YEAR-OLD shown in photo below consists of 44 blocks in six different shapes (shown in circles)—costs about $4.95 (figure 30 cents for each foot of 1⅜″-by-2¾″ maple needed). As child grows, shapes shown in photo at upper right are added to satisfy his desire to build more complex structures. Basic set can be cut on circular saw, but curved shapes require a bandsaw, and columns must be turned on wood lathe.

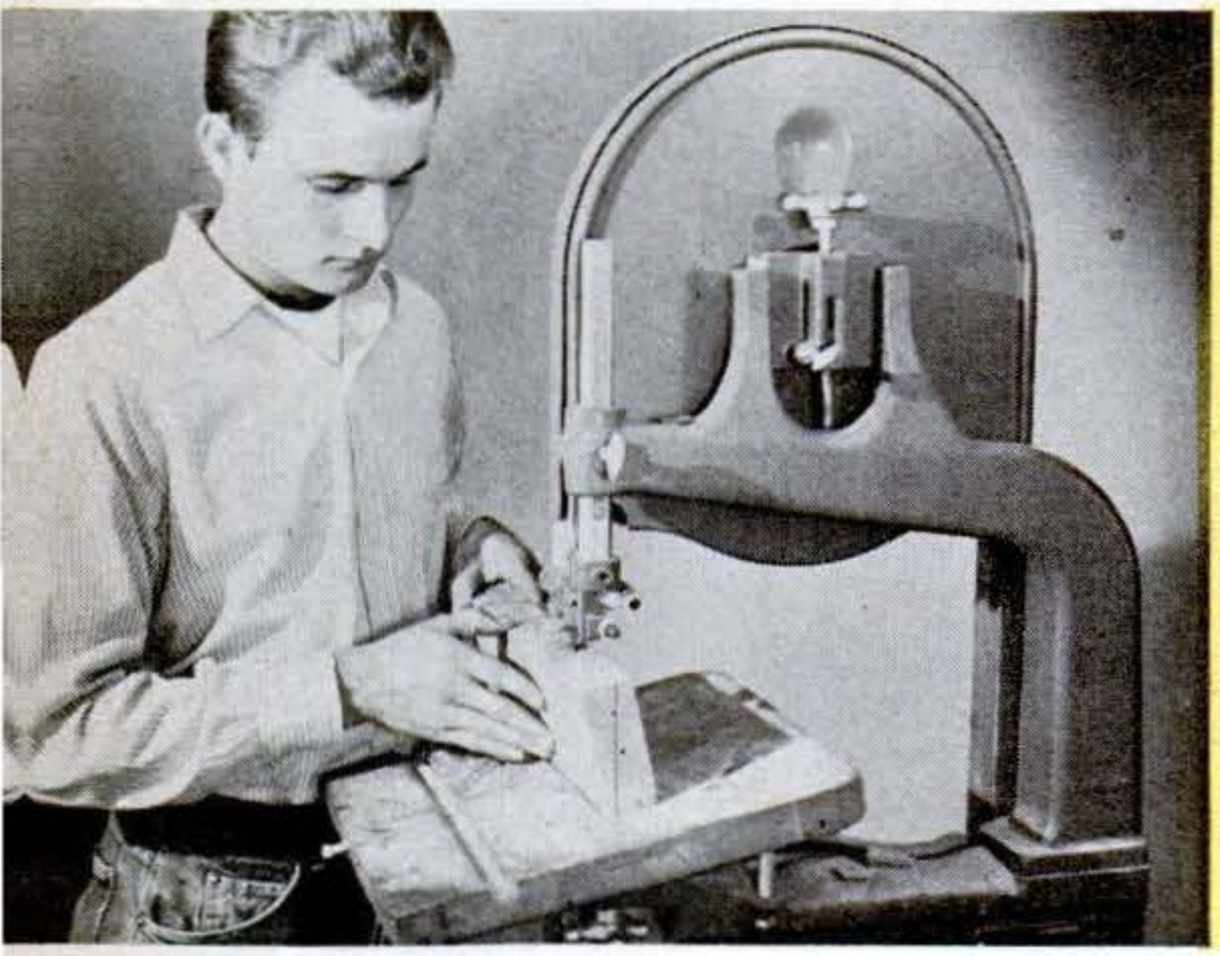




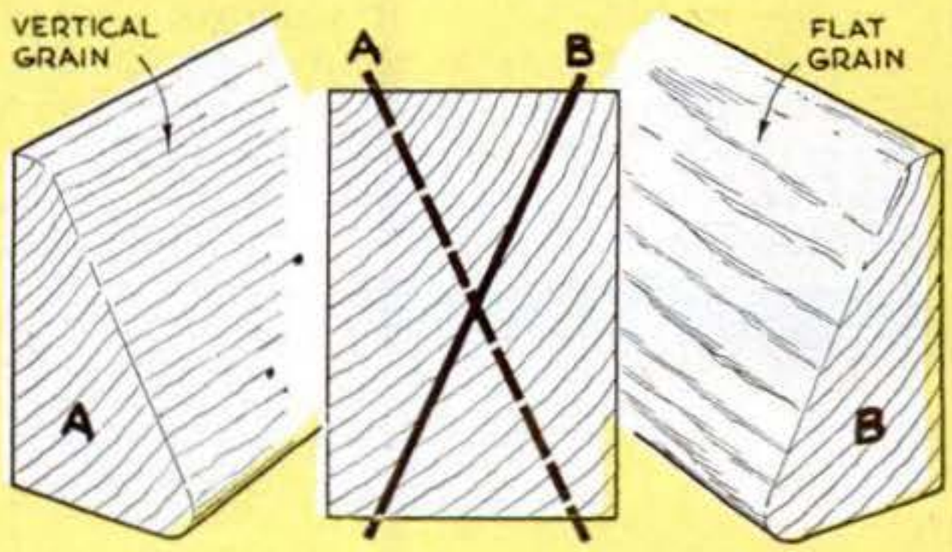


SINGLE BANDSAW PASS gives you two boards for every one. Mark guide line on upper edge and push board by pivoting it against upright fin set in block and clamped to table opposite blade. Use widest bandsaw blade you have.

IF BANDSAW WANDERS, you can keep it in line by first running stock through circular saw. Groove one edge, then turn board over and repeat operation. Bandsaw tracks in cuts.



TWO MOLDINGS FOR THE PRICE OF ONE. Ripping thick stock diagonally gives two identical wedge-shaped molding blanks. Because blanks are already tapered, they require minimum work on shaper. Angle of cut determines whether grain is flat or vertical.



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HOW TO
Get Two Boards Out of One

Setting up your own home sawmill and using these simple tricks will save you work and get more out of your wood.

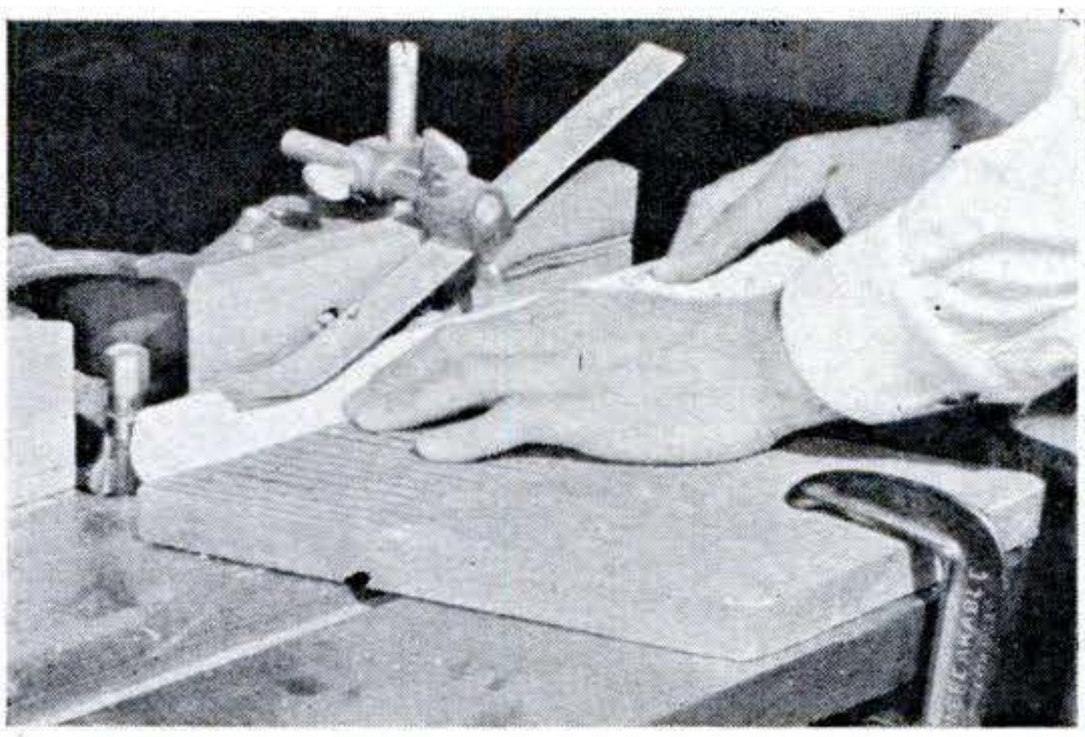
By Edwin M. Love

SAWING big boards into small ones gives you the exact size you need and cuts cost too. In effect, you buy the wood in bulk and do the millwork yourself. The technique is called resawing. And it can be used in a number of ways to shorten labor and stretch lumber.

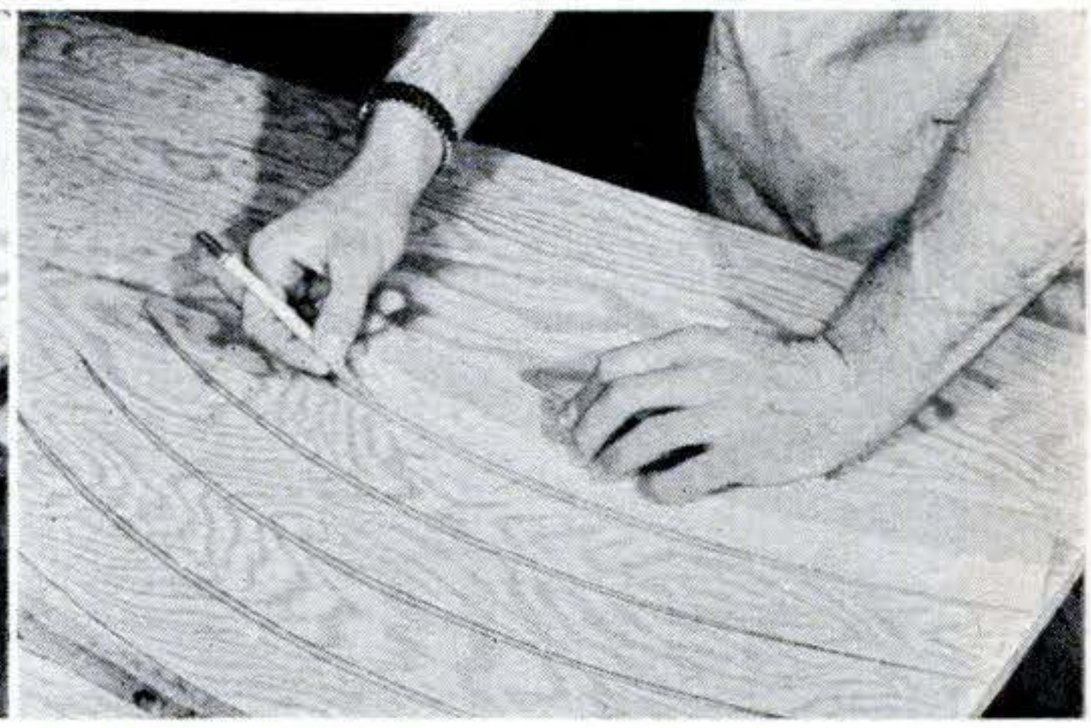
If you need ½″ pieces (actual measurement), you can slice three from the 1⅝″ that 2″ nominal stock actually measures, instead of only one out of 1″ nominal. You thereby get three boards for less than the cost of two. If it's molding you want, you can get two strips for every one by first ripping your stock in half on an angle.

By carefully figuring out what you need and then buying stock to cut down, you can make your own sawmill really pay off.

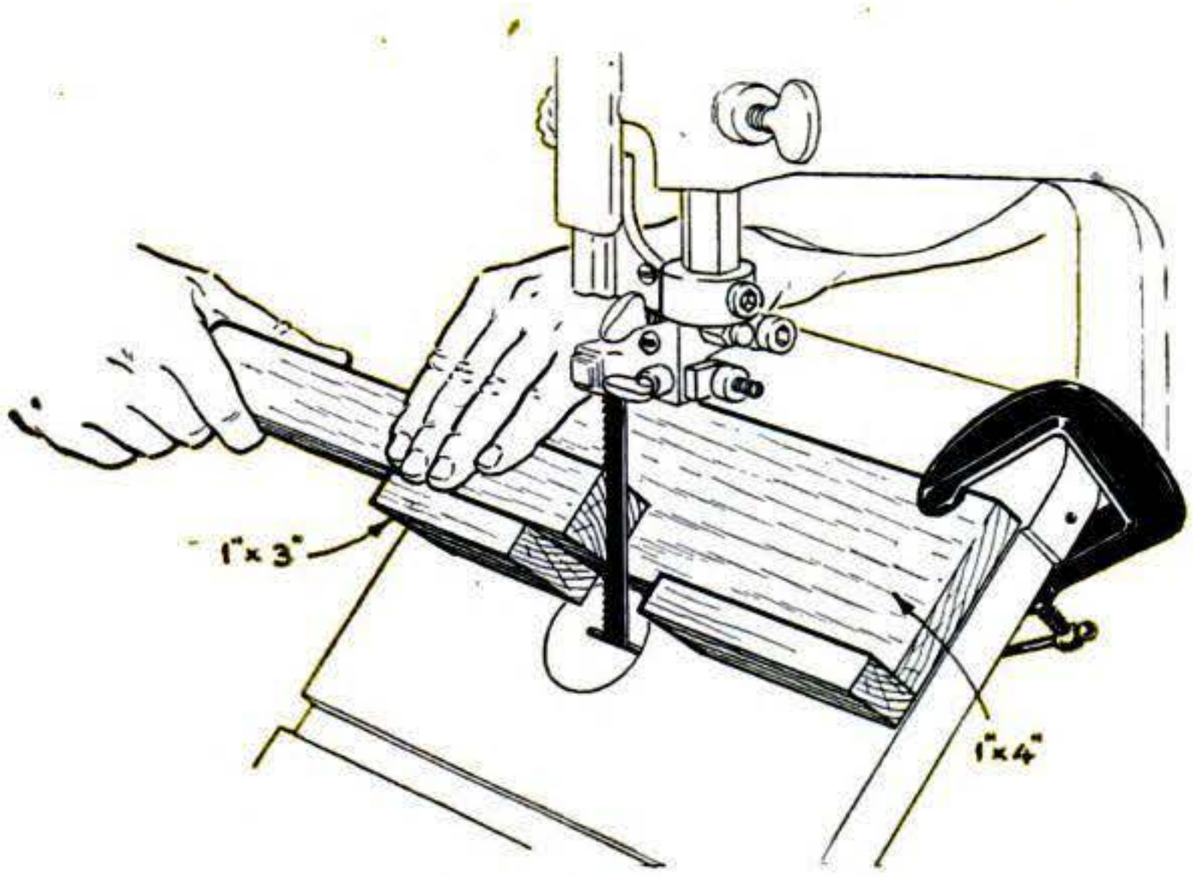
Next month, Mr. Love will show you how you can use lift sawing to make flat sheets of wood balloon into shapely bowls, vases, ship hulls and other intricate objects.



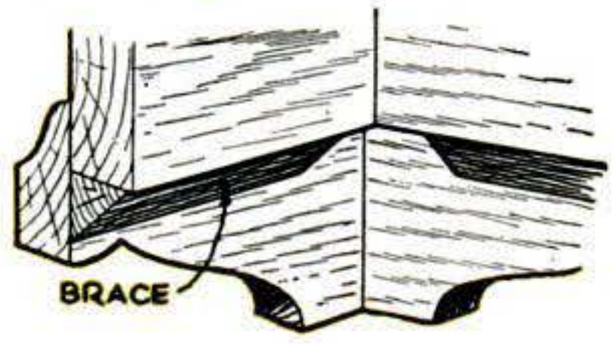
MOLDING A WEDGE, one of many things you can do with resawed lumber, is easy. Metal hold-down keeps wedge against table. Slotted wood "spring" pushes piece against fence.



CAREFUL NESTING of curved and other shapes saves work and wood. Only one saw pass is made along each inner curve, and excess left on outer curve of next piece is sanded off.



SPLITTING SQUARE STOCK on the diagonal gives two triangular strips ready-made for cutting into rub blocks. Wood jig (left), is notched at center for blade. Set bandsaw table at 45° and clamp on jig, allowing for blade "lead" so it will track right. Rub blocks make inexpensive braces.



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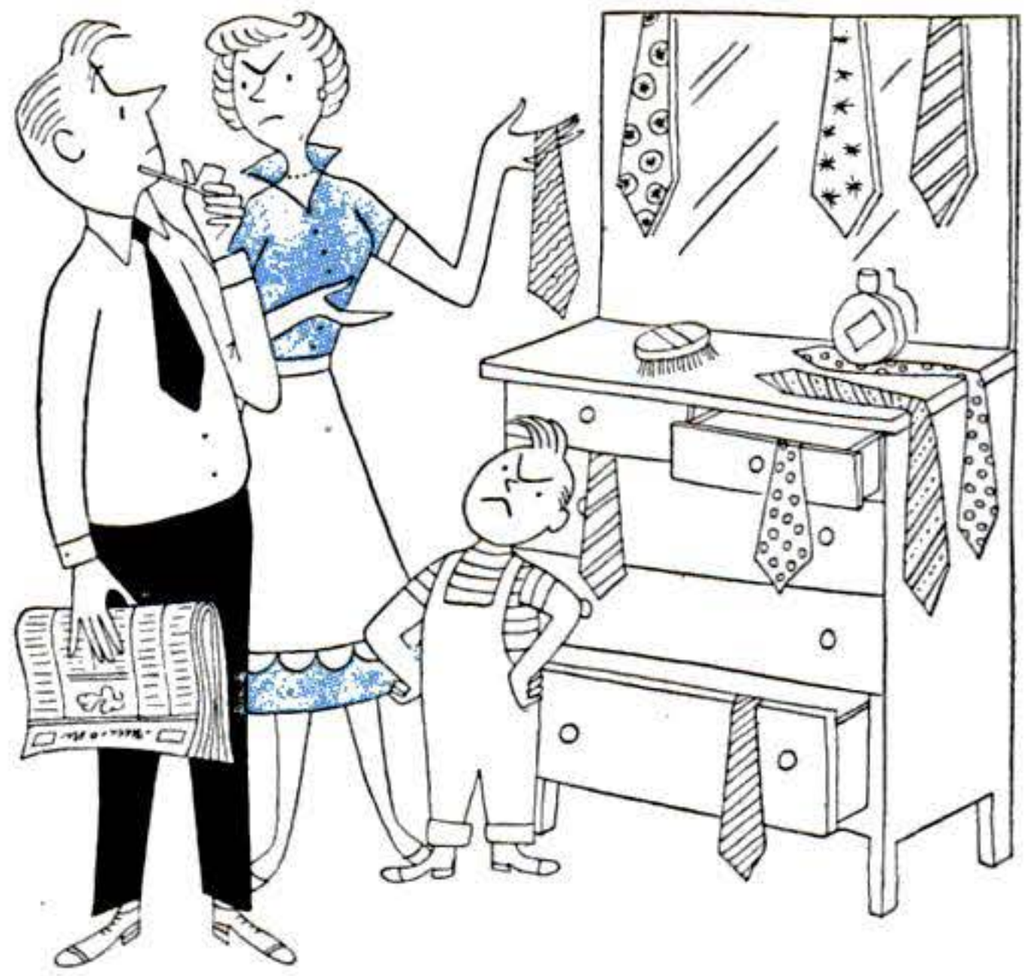
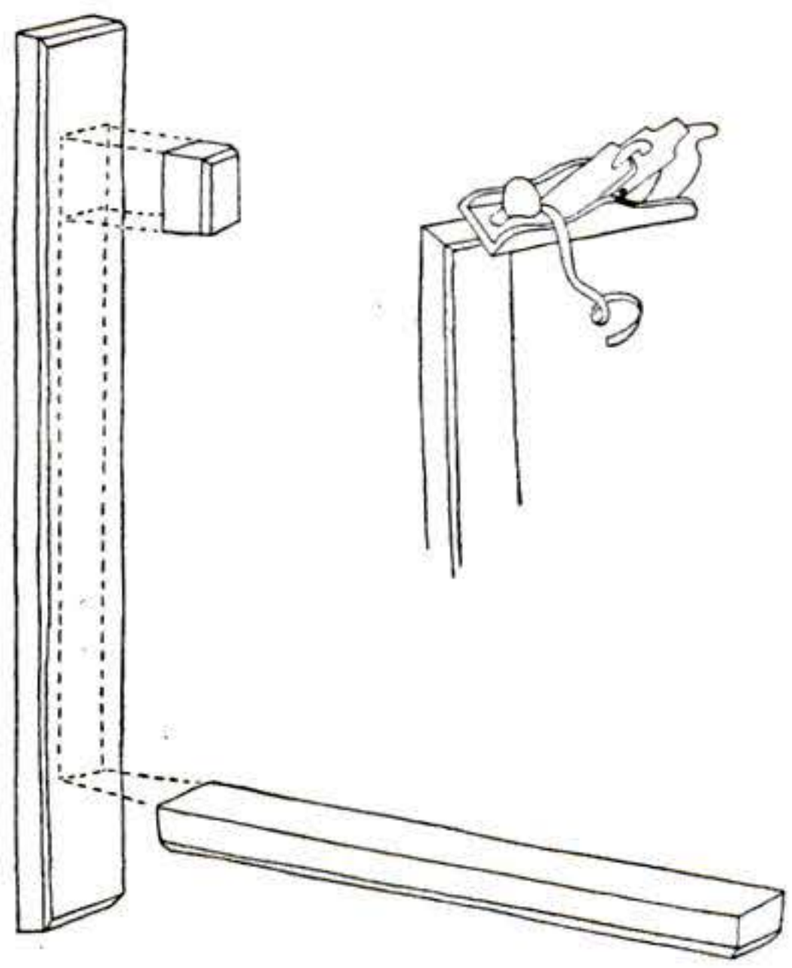
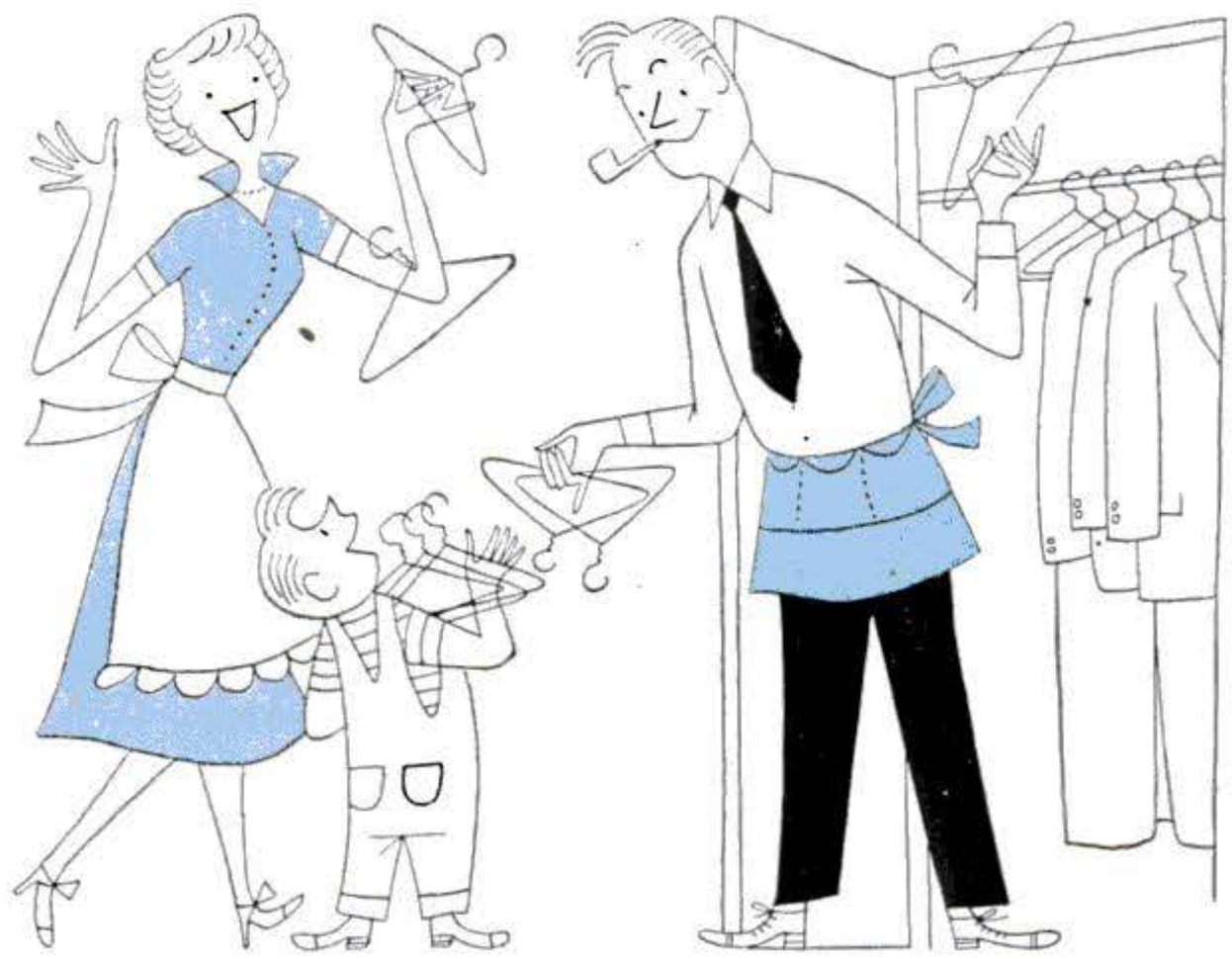
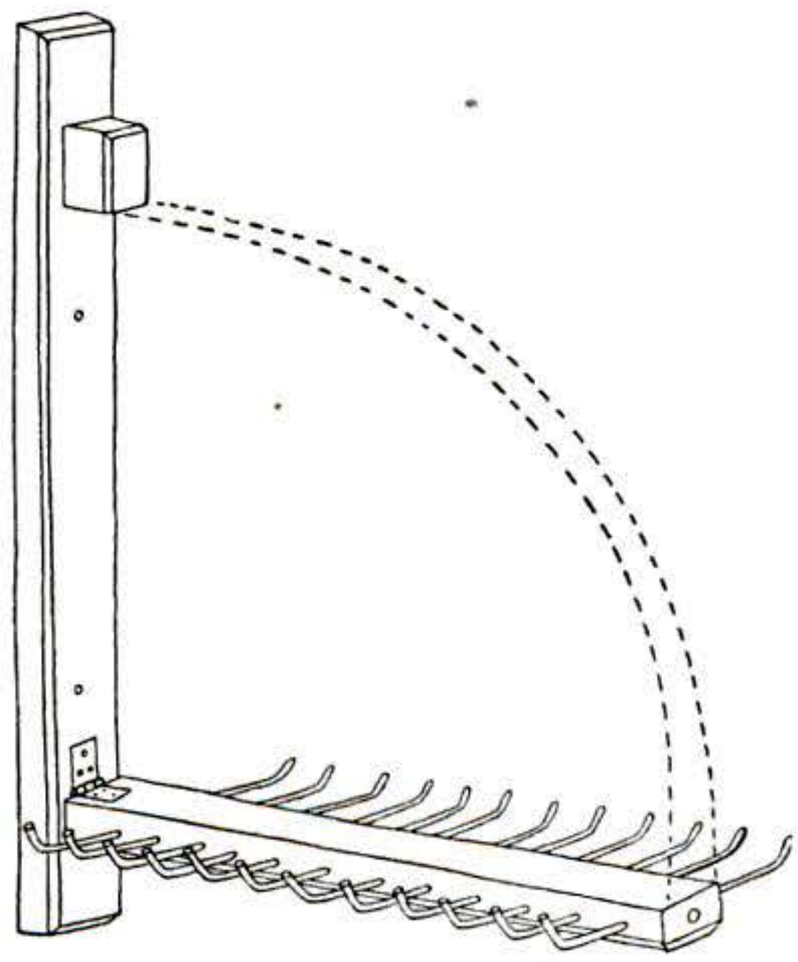
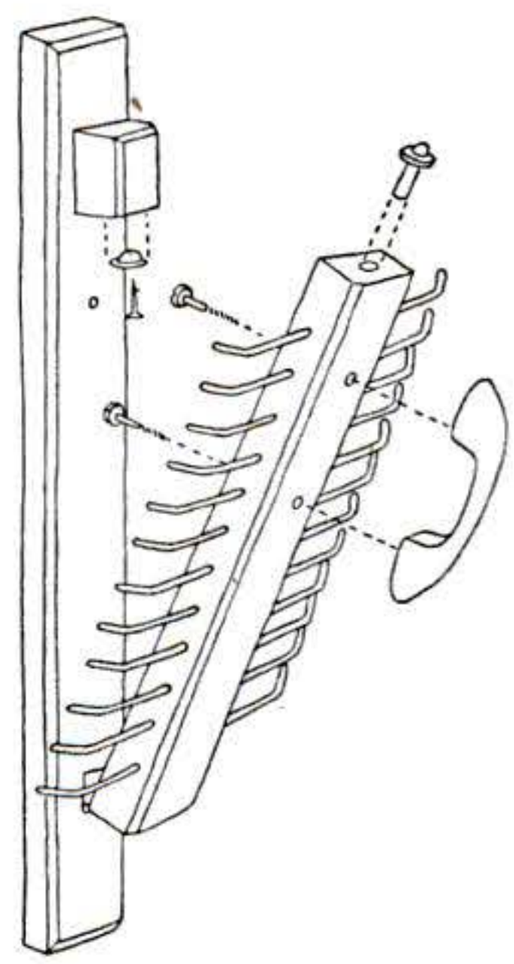
Wordless Workshop











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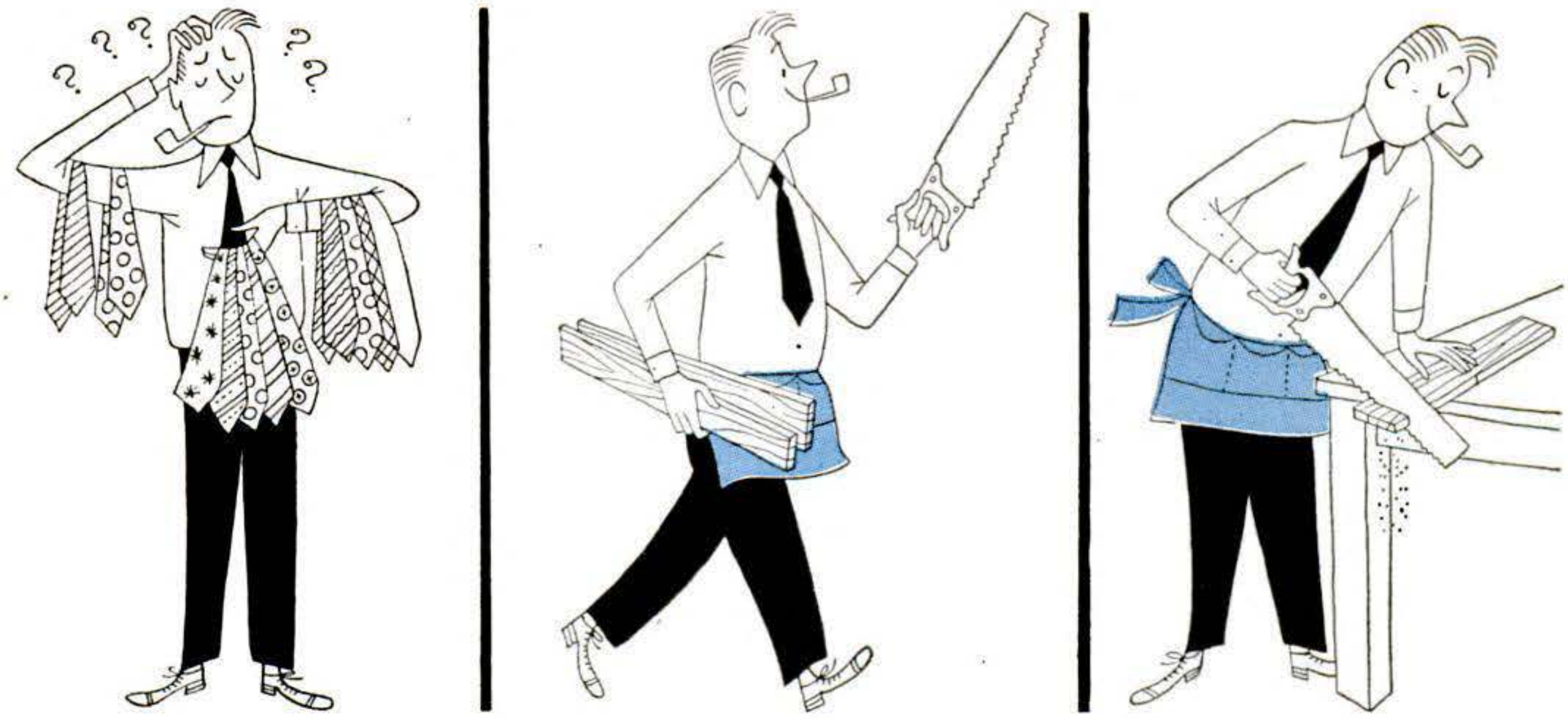

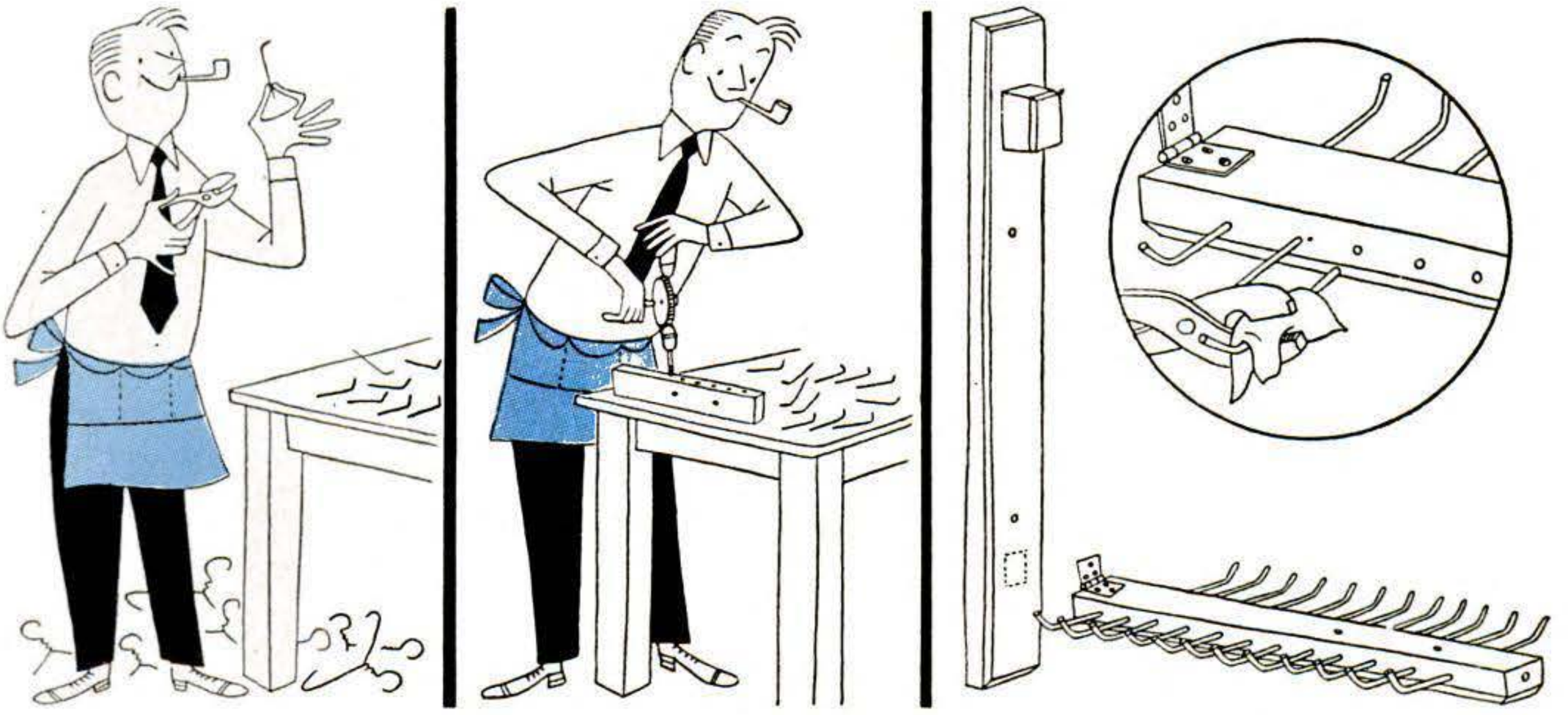

See PSM next month for another Wordless Workshop.

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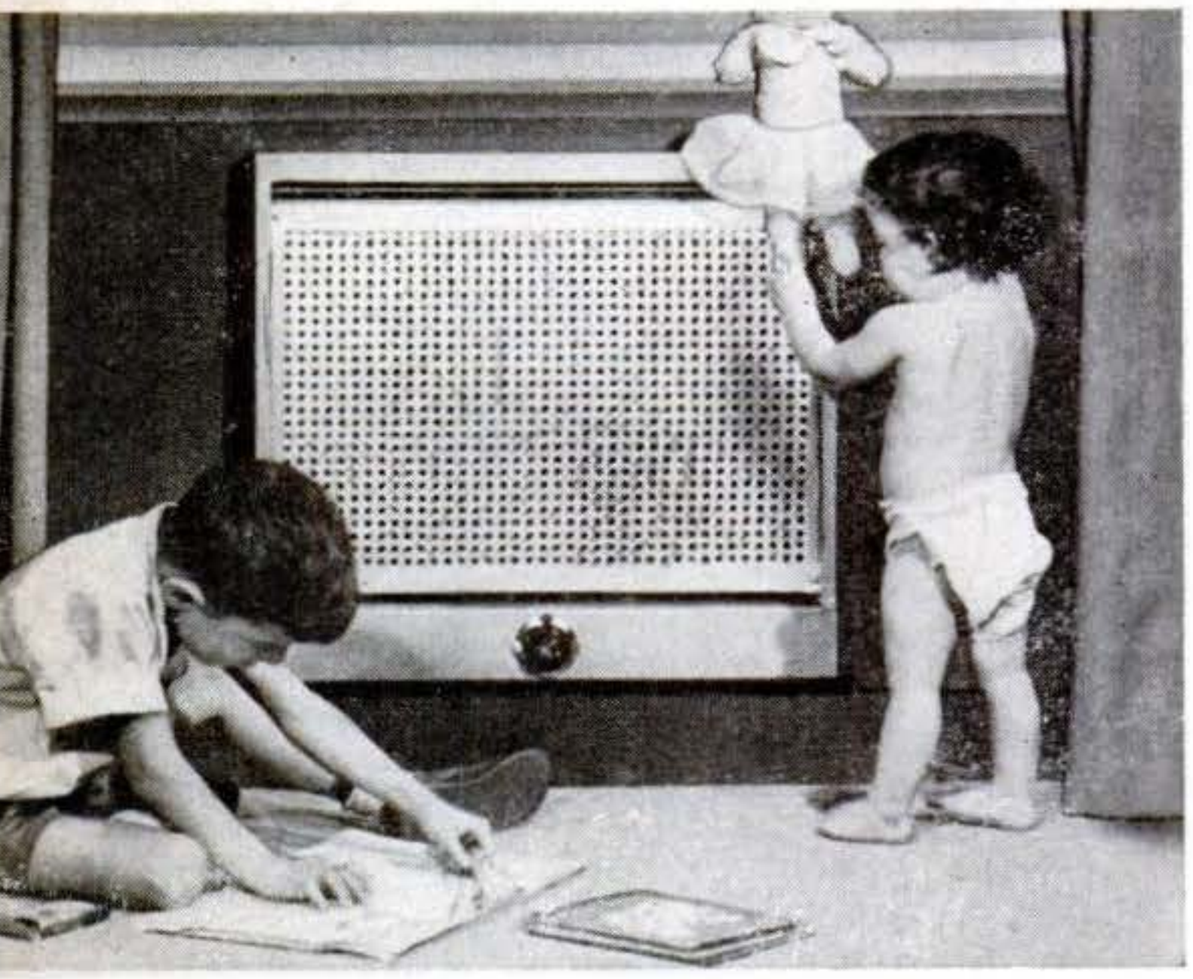
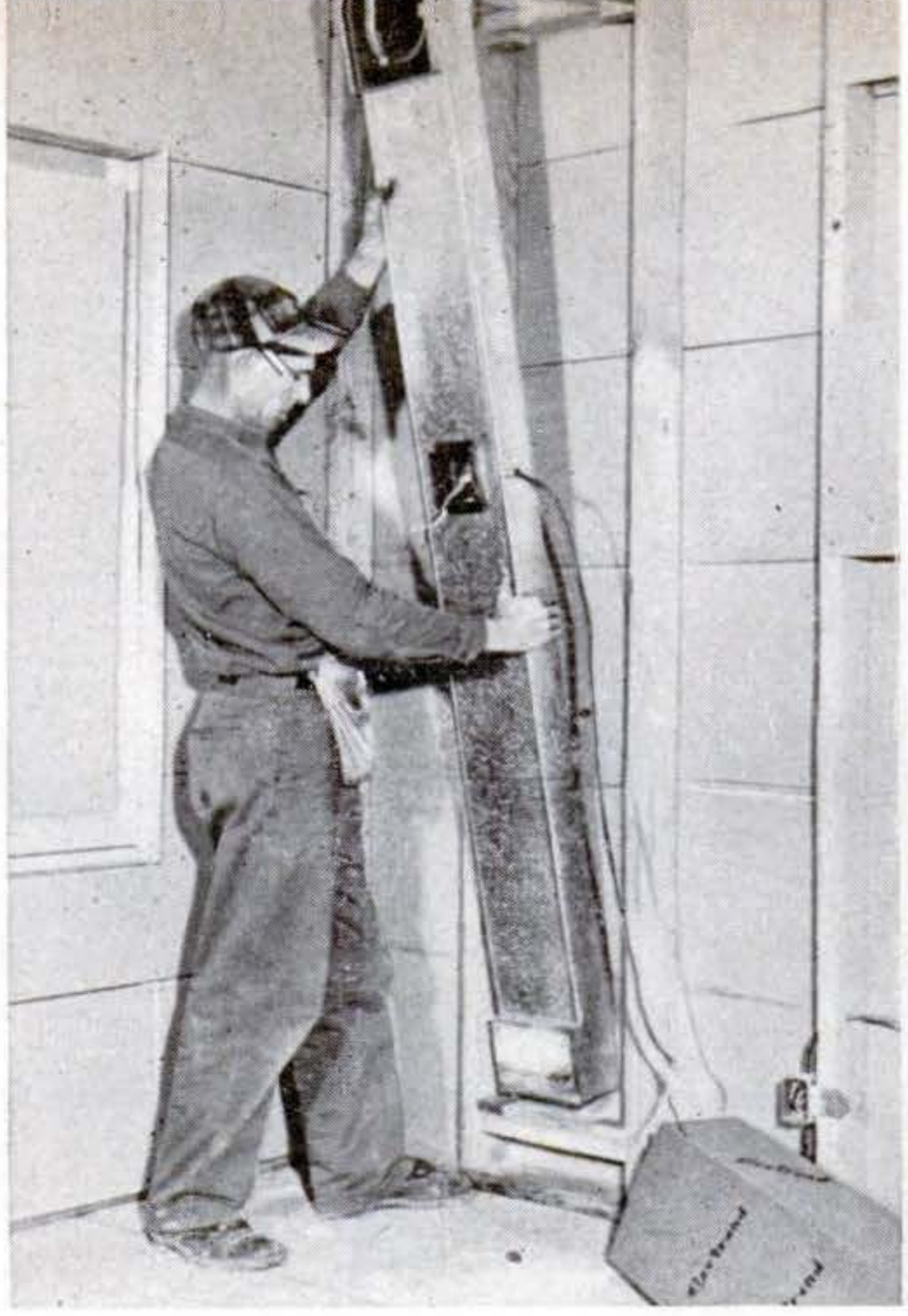
NEWS IN
Home Heating

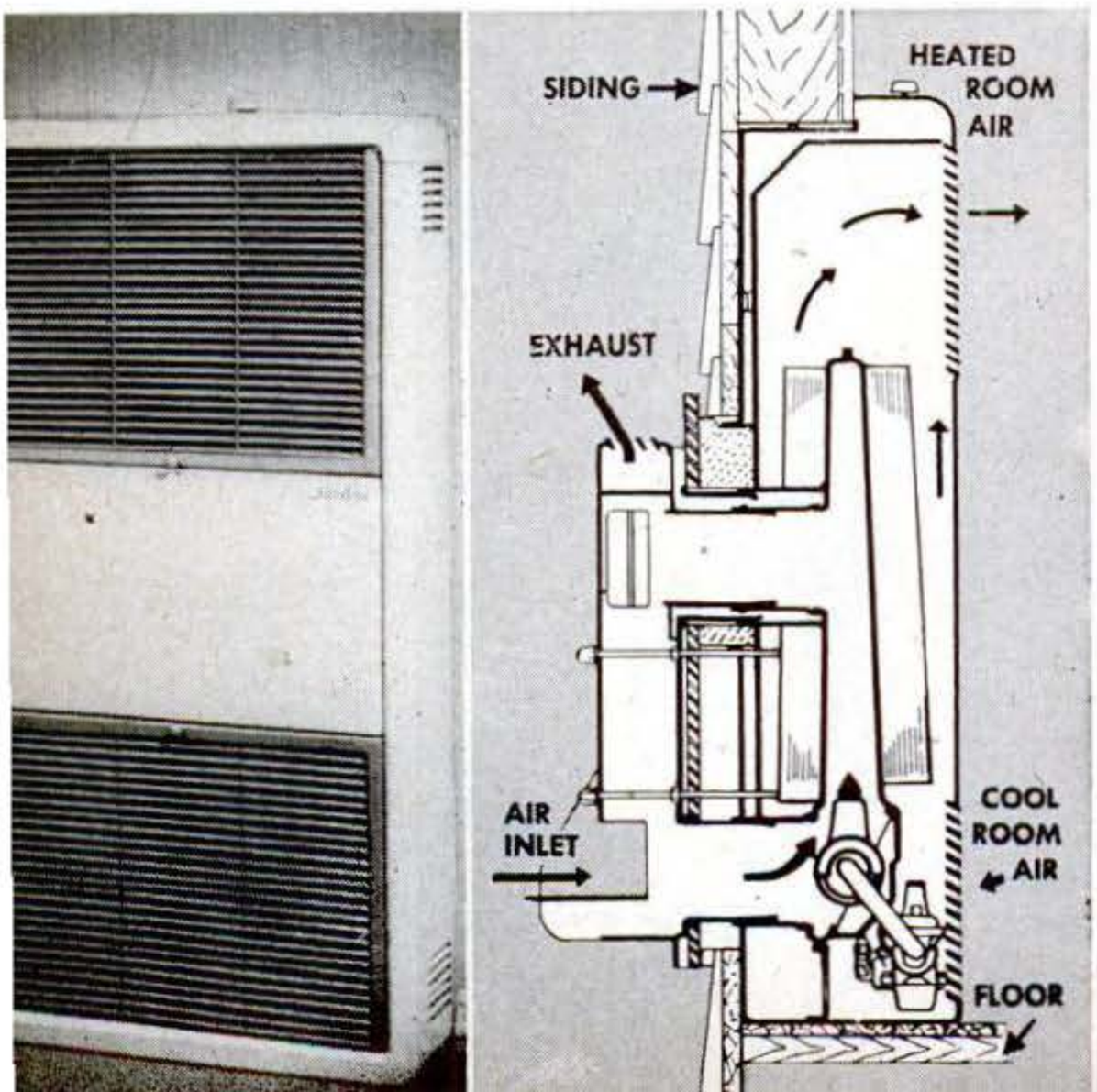


1. Radiant Coils Can't Burn. You can touch this radiant wall heater without getting burned, its makers say. Electric heating coils are embedded in a special ceramic panel that can be mounted anywhere without a shield. The units are also made in baseboard and portable models.



2. Heater Blows Hot and Cold. This electric room heater has a fan and heating coil to provide warm air in winter. In summer, the fan can be used alone. Each unit fits between wall studs. Because it draws in warm air at the ceiling, it's said to save power by recirculating heat usually wasted.

3. Heater Needs No Chimney. The chimney for the gas-burning wall heater below is a vent protruding through the exterior wall that carries away exhaust fumes (sketch). Air for combustion is drawn in through another outside vent so that no oxygen is burned out of the inside room air. Room air also is recirculated. The unit is sized to fit between the wall studs and has its own thermostatic control.



4. Space Heater. You can set a thermostat on this portable electric heater to keep the desired temperature. A pilot light shows when the heater is on. Separate switches operate the fan and heating coil.

5. Humidity Sprayer. Increased humidity for heating can be had with this centrifugal atomizer. It hooks to any warm-air system. It sprays water into heated air, adding three gallons a day.

Further information on these products can be obtained from: 1. Heatmore, 738 Broadway, NYC; 2. Electrend Products, Box 110, St. Joseph, Mich.; 3. Stewart-Warner Corp., Lebanon, Ind., 4. Titán Manufacturing Co., 701 Seneca St., Buffalo; 5. Walton Laboratories, 1186 Grove St., Irvington, N.J.

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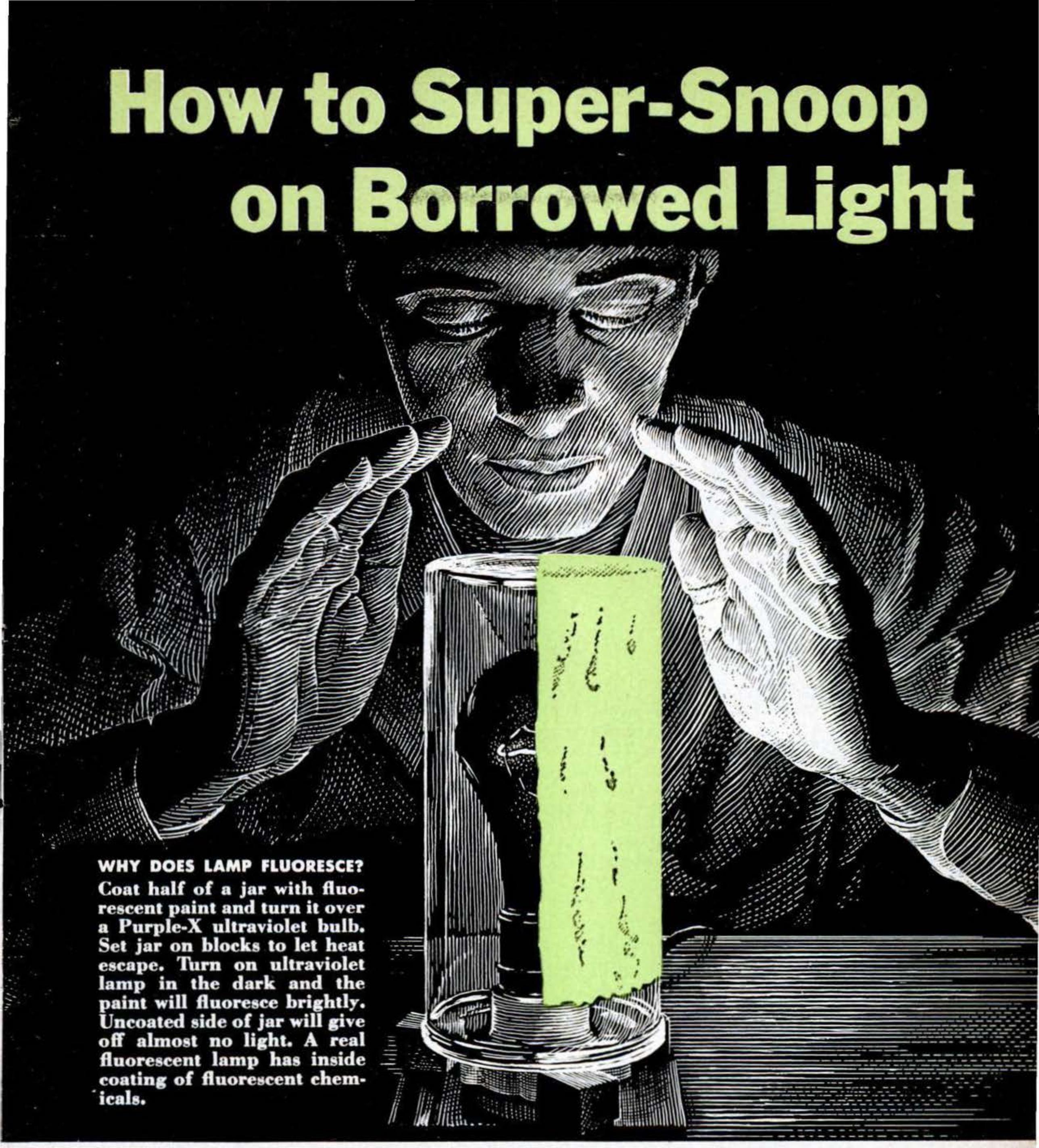
How to Super-Snoop on Borrowed Light



WHY DOES LAMP FLUORESCE?
Coat half of a jar with fluorescent paint and turn it over a Purple-X ultraviolet bulb. Set jar on blocks to let heat escape. Turn on ultraviolet lamp in the dark and the paint will fluoresce brightly. Uncoated side of jar will give off almost no light. A real fluorescent lamp has inside coating of fluorescent chemicals.

You're usually blind to ultraviolet rays, but this lamp lets you see them and many other things you've never seen before.

By Kenneth M. Swezey

NO MATTER how good your eyes are, you're really half-blind. But don't worry, everybody else is too. It's this defect in human vision that makes possible the gleaming new colors you see on magazine covers and bobby socks. Scientists use it not only to test ores but also to find whether mice are susceptible to cancer.

And you can put it to use for a variety of super-snooping—from seeing how clean your wife washes the dishes to finding whether Aunt Minnie has false teeth.

Our eyes are sensitive to only part of the

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CLOTHES LOOK WHITER when washed in soap or detergent containing an optical bleach, a colorless fluorescent dye that counteracts the natural tendency of white fabrics to turn yellow. If you wash a strip of cloth in a fluorescent detergent and another in plain soap, the first may look slightly whiter in ordinary light (left above). But look at them in the light of the ultraviolet lamp and the difference (right above) becomes startling.

light that hits them: they are blind to wave energy at the two ends of the spectrum—out beyond red at one end and violet at the other.

But there are a number of substances that can borrow invisible light from the violet end—the ultraviolet—and turn it into the kind we can see. A mineral called fluorspar was one of the first things found to have this property, so it is called fluorescence. Some vitamins, natural oils, minerals, even your teeth, can do this. Placed under pure ultraviolet light, a fluorescent object gleams in color when everything else is black.

(But don't confuse fluorescent objects—which only turn invisible light into visible light—with phosphorescent, luminescent or incandescent objects: they glow in the dark by emitting light of their own.)

Secret messages written with fluorescent inks glow in this "black light." So do invisible fingerprints or dirt on a plate when dusted with fluorescent powder. And because different substances fluoresce in different colors, things that look alike are found to be quite different when studied under ultraviolet light.

The new fluorescent inks and dyes achieve their unique brightness in the same way. A fluorescent red ink, seen in daylight, not only reflects practically all the red in the light that hits it, but borrows invisible light and changes it to red—actually "reflecting" more red light than falls on it.

Fluorescence has another valuable use in electric lighting. A glass tube or plate coated with a fluorescent material glows all over when bathed in ultraviolet light, giving a wide, even light source instead of the small bright source of the filament lamp. The ultraviolet light in a fluorescent lamp comes from exciting a gas with alternating current.

You can use this trick of borrowing light

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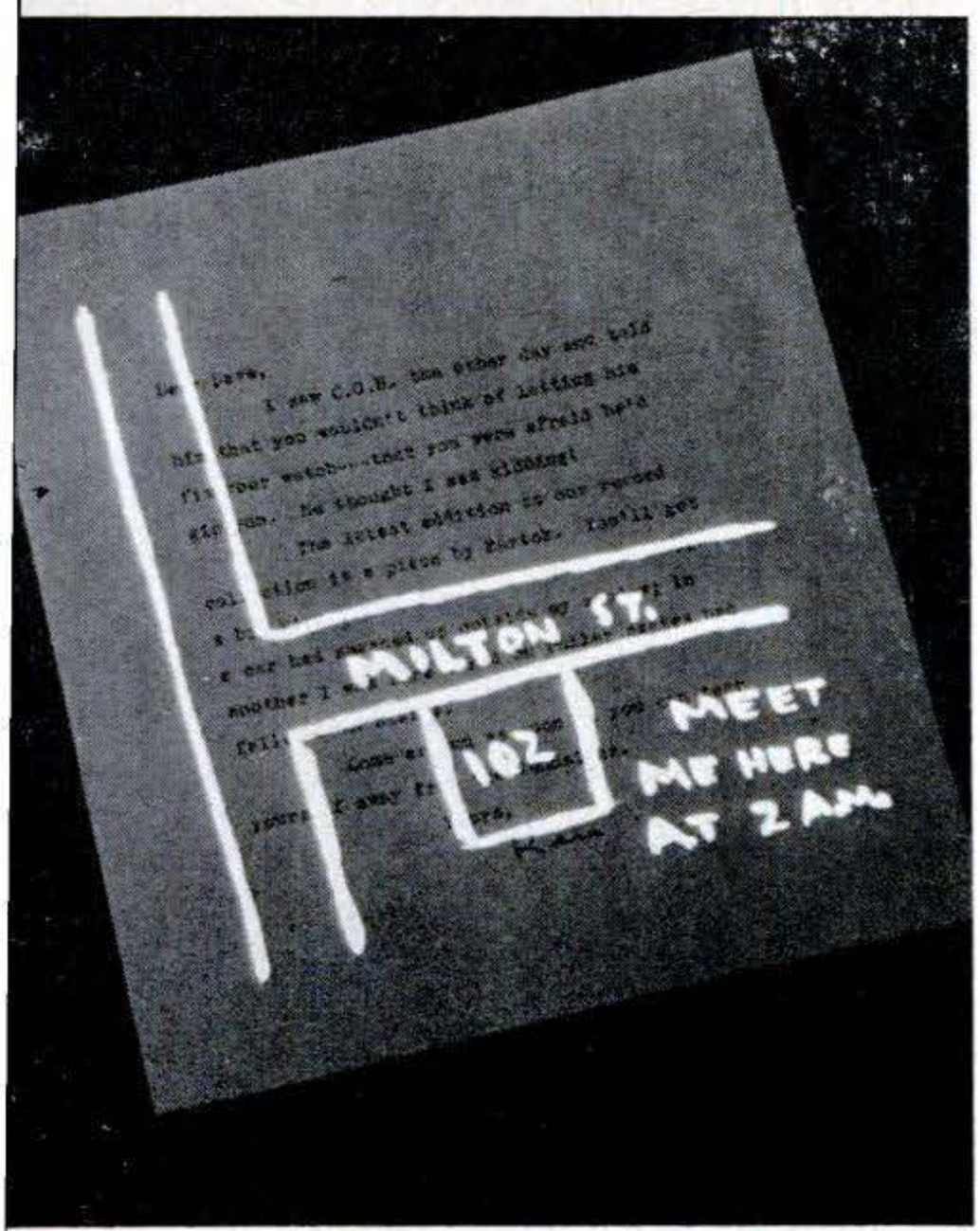
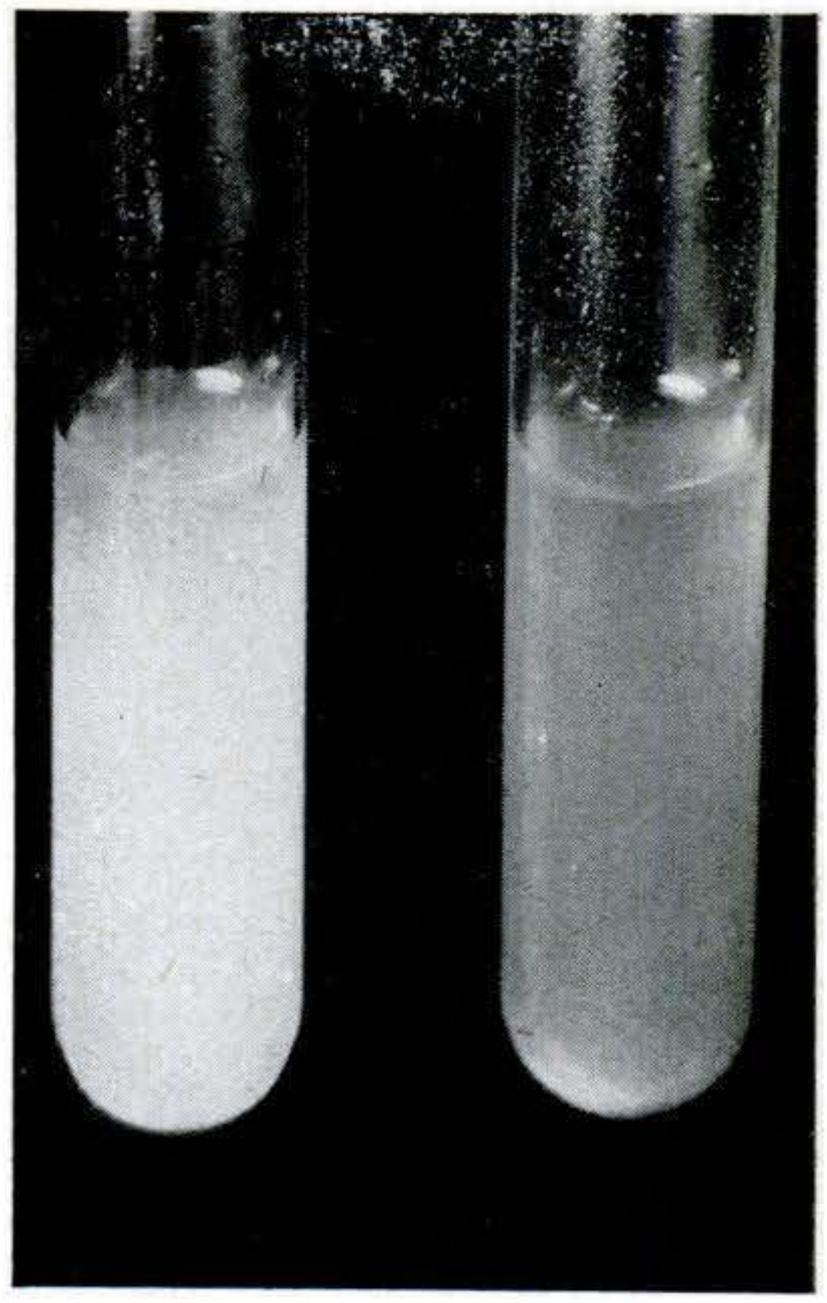


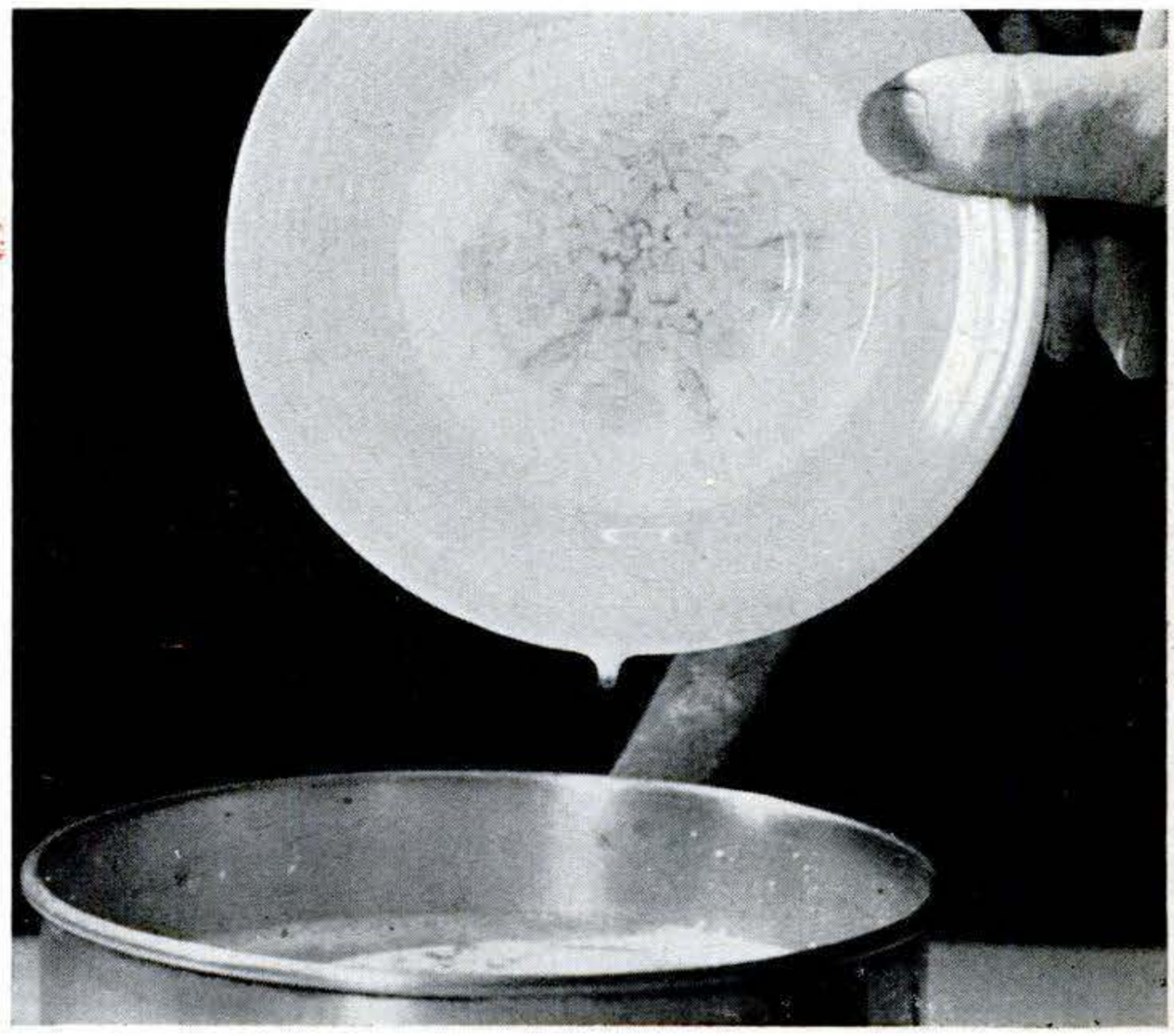
INVISIBLE INK has long been a trick of spies. Write on paper with a strong solution of anthracene in benzene or fluorescent soap in water. Let this dry. Then type a normal message on the paper. Viewed under "black light," your invisible writing will shine as at left.



BUTTER OR OLEO? If you can't tell by the color, an ultraviolet test will usually show you. Dissolve butter in lighter fluid in one test tube, margarine in another. Under ultraviolet light, the margarine fluoresces bright blue, but the butter fluoresces a weak yellow.

in your home lab with the help of a Purple-X ultraviolet bulb, which you can obtain from dealers in scientific apparatus or display lighting for about $1.25. Basically this is just an incandescent lamp, but its extra-high-temperature filament is surrounded by a globe of red-purple glass that holds back most of the visible rays. It can be operated from any 115-volt circuit, without transformers or filters. Because most of the heat from its 250-watt filament is absorbed by the glass, the bulb should, however, always be used in a metal reflector and should not be used more than a few minutes at a time. When so used its burning life should be about 50 hours.

The rest of your equipment is easy to get—soap powder, candles, butter, margarine and any fluorescent paints you can come across. Also Aunt Minnie's teeth, if you can coax her to come into your dark lab and grin under ultraviolet light. END



ARE THE DISHES CLEAN? A health-department chemist in New York City devised a test to find out. Suspected dishes are dipped in a solution of optical dye and examined under ultraviolet light. The dye clings to any food particles remaining. You can dip a plate into cold dish water in which you have dissolved a fluorescent washing powder. Let the plate drain. If there are food particles on it, Purple-X bulb will cause them to glow.

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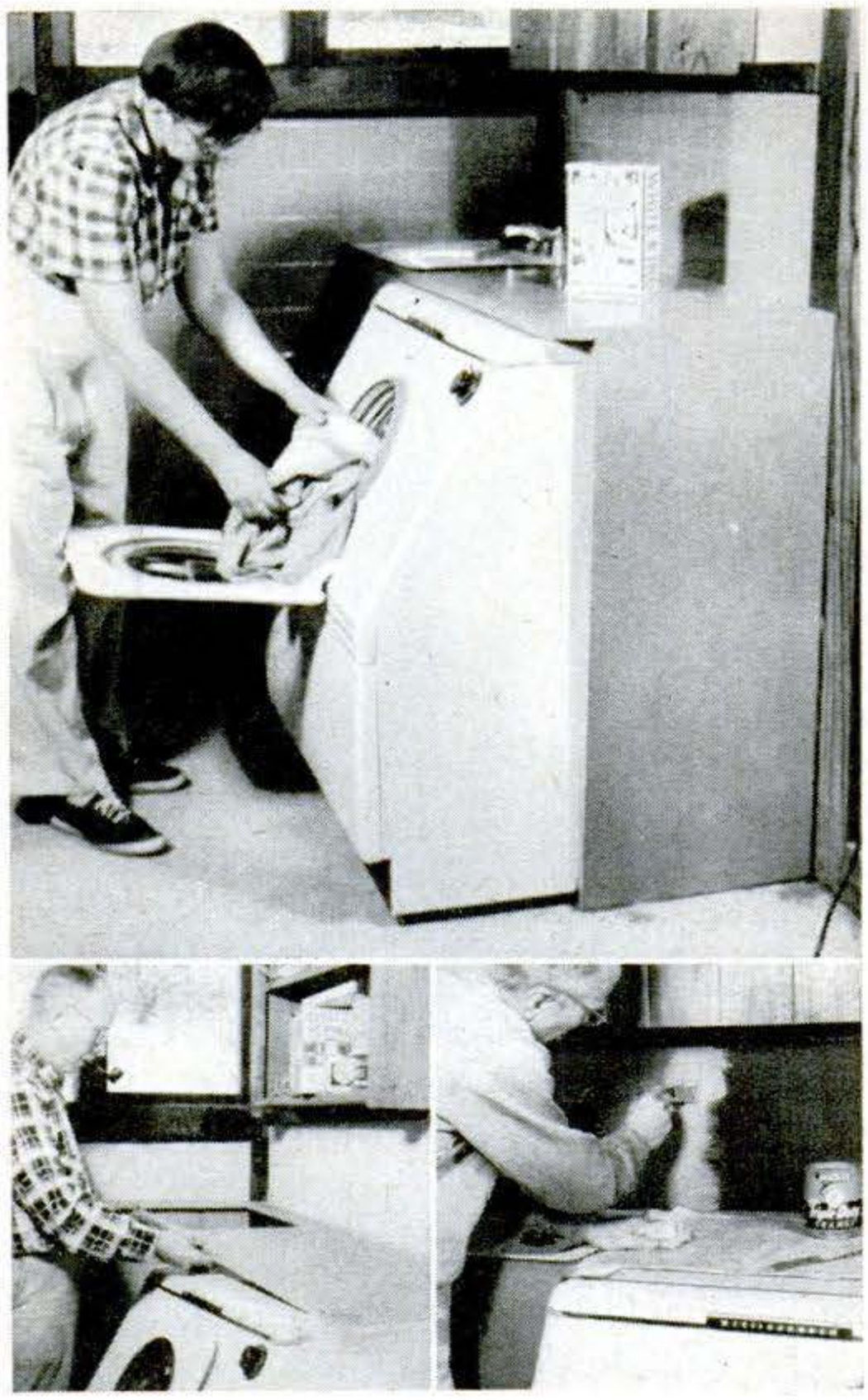


Corner Unit Houses Washer

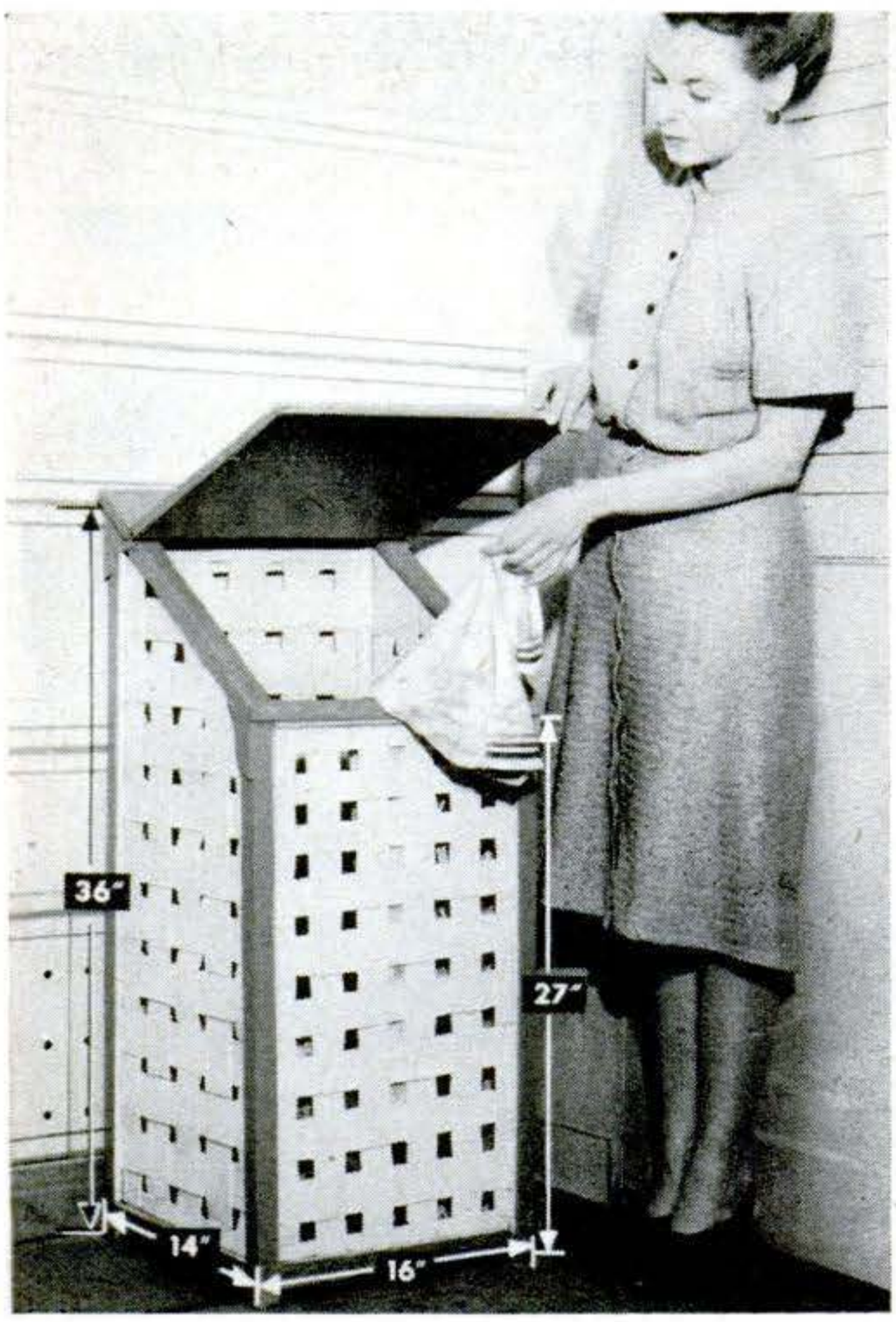
A LAUNDRY corner built around our new automatic washer not only gives my wife extra working space, but hides the stack that drains waste water. And since the water supply and drain were handy, it was a cinch to hook a small wash basin beside it for convenient clean-up after work outdoors.

Since our machine loads from the front and has the controls there, I was able to enclose it on all other sides. For the work shelf, the exposed end and the door below the sink, I used ¾″ plastic-surfaced plywood. Covered with a coat of good enamel, this can be washed and scrubbed.

The shelf is supported by two-by-fours screwed flat to the two walls. The exposed shelf end rests on another panel of plywood that is fastened at the back to a nailing strip on the door frame. A 16″-by-20″ hole in the work shelf takes the lavatory basin. Below this is storage space enclosed by a plywood door.

The walls around the unit are covered with tileboard attached with waterproof linoleum paste. The tile lines were striped with a different color. An inch clearance all around gives ample room to slide the machine out.—*Paul Corey, Sonoma, Calif.*

Homemade Hamper of Woven Latticework Airs Clothes



THIS woven latticework hamper makes a convenient place to store soiled clothes and also provides needed ventilation.

The four side frames can be made of ¾″-by-1″ strips. Plywood gussets at the upper corners add strength. Lattice strips ⅛″ by 2″ can be sliced on a circular saw and allowed to stand in water until pliable. Then they should be woven into four panels, tacked to the inside of the frames, and the frames glued and nailed together.

A ½″-plywood floor fits between the lower frame members. Strips of ¾″ quarter round are tacked into all inside corners. The lid can be ¾″ plywood or 1″ stock hinged to a narrow piece at the rear. Strips added along the two slanting edges and across the front form decorative sills. Paint the hamper in bright colors.

Foil Protects Portable Radios

WRAP batteries or power packs in aluminum foil before installing them in portable radios. This will protect the set from damage if the batteries should corrode or leak acid. —*Donovan Merry, Hillsboro, Ill.*

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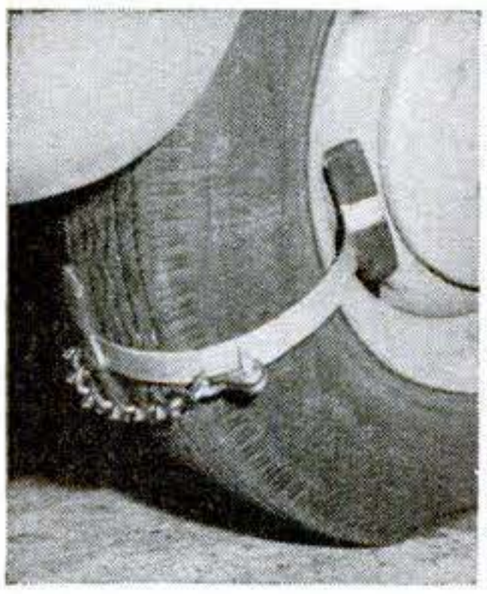
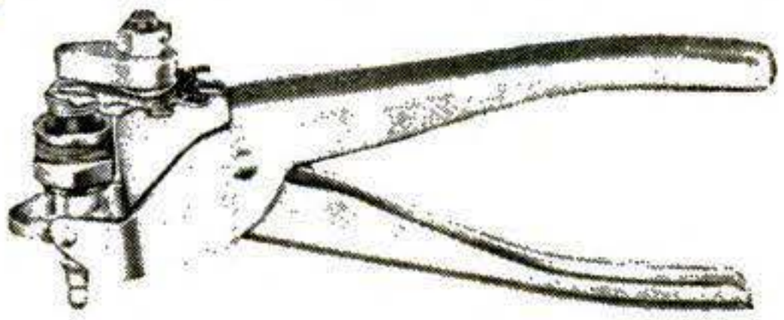
New for Your Car

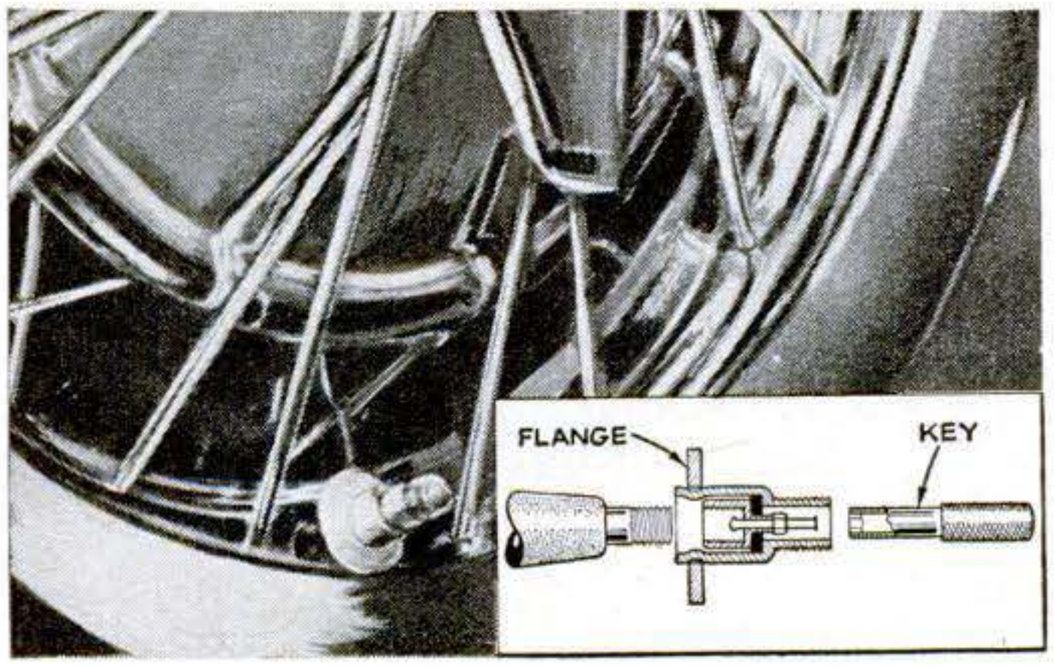
1. Heating Pad Plugs in Dash. You can keep your back warm while driving with an electric heating pad that plugs into the cigarette-lighter socket. Designed for long trips where the regular heater might cause drowsiness, the pad works on any six-volt system.



2. Tire Chains Slip On. You can put on these skid chains without jacking up your car or fastening any connectors. Each chain is fixed to a spring-steel band that clamps over the tire, holding it on.



3. Pliers Set Plug Gap. Gaps from .022″ to .040″ can be set automatically by rotating the wheel of these pliers to the proper prong, slipping the prong between the electrodes, and squeezing.



4. Locks Foil Thieves. Wheel disks and wire-wheel inserts can be protected with tire-valve locks. A key is used to screw a flanged locking cover over the regular valve stem. The lock turns freely on an insert (sketch), preventing removal.

5. Timer Works on Six or 12 Volts. You can't make a wrong hookup in connecting this timing light to either a six- or 12-volt system. A relay automatically selects the correct voltage. The light is also said to have increased brilliance.

Further information on these products can be obtained from: 1. Dimensional Products, 166 2nd Ave., NYC 3; 2. Automic Non-Skid Chain Co., 350 Fifth Ave., NYC 1; 3. Clark-Feather Mfg. Co., Ft. Morgan, Colo.; 4. Spencer Specialties, 3305 Wilshire Blvd., Los Angeles 5; 5. Allen Electric Equipment Co., 2101-2117 N. Pitcher St., Kalamazoo, Mich.

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"Are you checkin', Mr. Wilson, or just guessin'?" Harvey drawled.

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Gus Goes Hunting ...for Trouble

The tall Texan had bagged the biggest buck Gus had ever seen, but his tongue was just as sharp as his shooting.

By Martin Bunn

GUS had a car up on the rack, and he was working with the swift efficiency of long practice, but his thoughts roamed elsewhere. Tomorrow was Thanksgiving Day. And though Stan Hicks, his helper, had kidded him unmercifully about it, Gus just had a crazy hunch that he was going to win that turkey raffle down at Schutzheimer's meat market.

If he did, Sam over at the lunch wagon had promised to cook him a big turkey dinner with all the fixin's—which would help a little to make up for Gus's disappointment about something more important. This year, for the first time since he could remember, he had not been able to get away from the Model Garage during the deer-hunting season. And what Gus really craved was a couple of days' hunting—and a nice big juicy venison steak.

The phone rang. Ah-hah, thought Gus, maybe that was Karl Schutzheimer now—to tell him he was the lucky winner of a plump gobbler.

The Model Garage Gets an SOS

It wasn't. Instead of Karl's familiar explosive accents, the voice on the phone came over as a lazy drawl.

"Howdy . . . Gus Wilson?" It rolled out slow and easy. "This here is Bill Harvey of San Angelo, Texas. I'm a few miles out of town at a farmhouse on . . . let's see. I got it written down here . . . it's Eye-thacka Road. Need a tow truck to haul that lizzie of mine in. She won't run for hoot nor holler!"

"All right, Mr. Harvey. Whose farm is it?"

"Folks named Peeble—they told me to call you. I'll be standin' by their mailbox."

"Okay. I'm on my way." Gus hung up. "Stan, take over while I go out on a call. And when Karl phones about my bird, tell him I'll be back."

"You better go buy one, boss," Stan chortled. "Somebody may give you the bird—but I bet it won't be a turkey!"

Gus glared good-naturedly and backed the truck out.

Texan Has Killed His Buck

Ithaca Road, or "Eye-thacka" as the Texan called it, ran north from town. It was more or less in the farm country at the edges of the heavily wooded hills bordering the area. The road was clear—there had been only a couple of snow flurries up to now—and Gus knew where the Peebles lived, so it only took a few minutes to get there.

He found Bill Harvey standing, long and lean and looking like a piece of sunburned leather, near the Peeble mailbox. Harvey was spattered with blood from shoulders to knees.

Gus squealed to a halt and jumped out. "You didn't tell me you'd been hurt!"

"Shucks, Mr. Wilson, I ain't hurt. This here's deer blood. Reckon I got it all over me haulin' that buck down the mountain to our car."

"You had me worried! Where's the car?"

"Up this side road a couple of miles. Had to walk down here. Lost a lot of time doin' it. And I gotta get that buck into town by five this evenin' or we won't win the contest!"

"What contest?"

"The one the Chamber of Commerce over at Parsonsville is runnin' for the biggest buck

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killed in the county durin' the day. And I'll roll a frijole from here to Texas if we don't have the biggest doggone buck you ever laid eyes on! Besides, that prize is a hundred bucks. Pretty good odds, eh? A hundred bucks for just *one* buck." Harvey grinned expansively at his own joke.

Gus Takes to the Hills

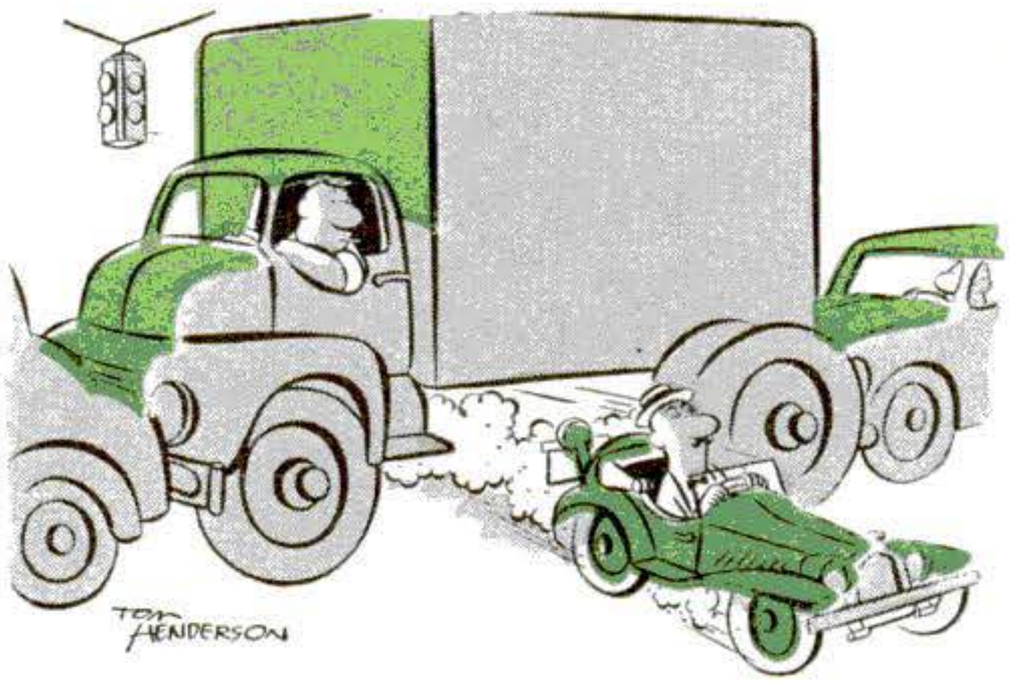
Gus recalled Stan's bewhiskered gag about the turkey—this seemed to be a day for corny humor.

"We've got plenty of time to tow her in. Not quite three yet."

He climbed behind the wheel. Bill Harvey got in and they drove on up the road.

"Came up here from Texas to spend the holidays with my boy Pete and do some huntin'. He lives over in Parsonsville with his wife and two kids. Well, we sure got us a king-size deer anyhow!"

Gus nodded, and kept an eye on the clock until two miles had ticked off. Shortly after that Bill Harvey told him to stop. "Right here'll do. This here truck's too big to squeeze through where my jeep went."



"You mean she's off the road?"

"Yep. She's another half-mile or so up the hill."

"Nothing to do but go up and look at it, I guess. Unless you want to carry that deer down and take it to the contest in my truck."

"No, don't think that'd work. Luggin' it through the brush would take from now until Texas recognized the United States! That buck is the granddaddy of 'em all!"

"Well, let me grab my tool kit. You lead the way."

Harvey set off at a long-legged pace and in a half-hour, after pushing their way through brush up a steep slope, they reached the jeep. Harvey's son, Pete, the spitting image of his old man, stood by a front wheel. In the back of the jeep, its head and rear legs extending over each side, was the biggest buck Gus had ever seen.

"We got a mechanic now, Pete. This here's Gus Wilson."

Gus shook hands with Pete, and when he caught his breath, began looking under the jeep's hood.

"She died and wouldn't start again. We had it up farther and around the hill, maybe another half-mile. She got warm running up and down over this rough ground. I thought maybe she got a vapor lock, but changed my mind when coolin' the carburetor with water didn't do any good. We got her to run again for a short time, after she sat a while, just before I started lookin' for a phone. But she quit for sure then."

"I see. We'll have you out of here soon, with any luck at all."

"Mister, I hope so. Winnin' that contest means a lot to my boy and me. And we're mighty anxious to tote this buck home and show the folks. Maybe you're a hunter yourself and know what I mean."

Gus knew what he meant. He gave the jeep a quick once-over. The engine was dirty with the oil and grime of thousands of miles. But on that first examination, Gus found nothing that would cause the engine to fail.

There might have been a vapor lock, and Gus hit the starter to make sure before going any further. The engine caught immediately.

Young Harvey shoved his hat back on his head. "I'll be dogged! It wouldn't do that a few minutes ago!"

"You might have had a vapor lock, although if Pete here wasn't able to start it up in all that time you were hiking for a phone, it would be a pretty stubborn one . . ."

Before he could finish, the engine sputtered and died. Gus hit the starter, but it only coughed, and refused to catch again.

"Just like before," Bill Harvey drawled.

Time Is Growing Short

Gus rolled up his sleeves and frowned. He dismantled the fuel pump and made a check. It was another part that should be replaced, but even with a well-worn diaphragm, it was still in operating condition. Replacing it carefully, he went on to examine the carburetor.

The carburetor was loaded with silt, when he got down inside. He had Harvey pour gasoline in a tin can to rinse it out with.

"Now try," Gus said after putting it back.

[*Continued on page 256*]

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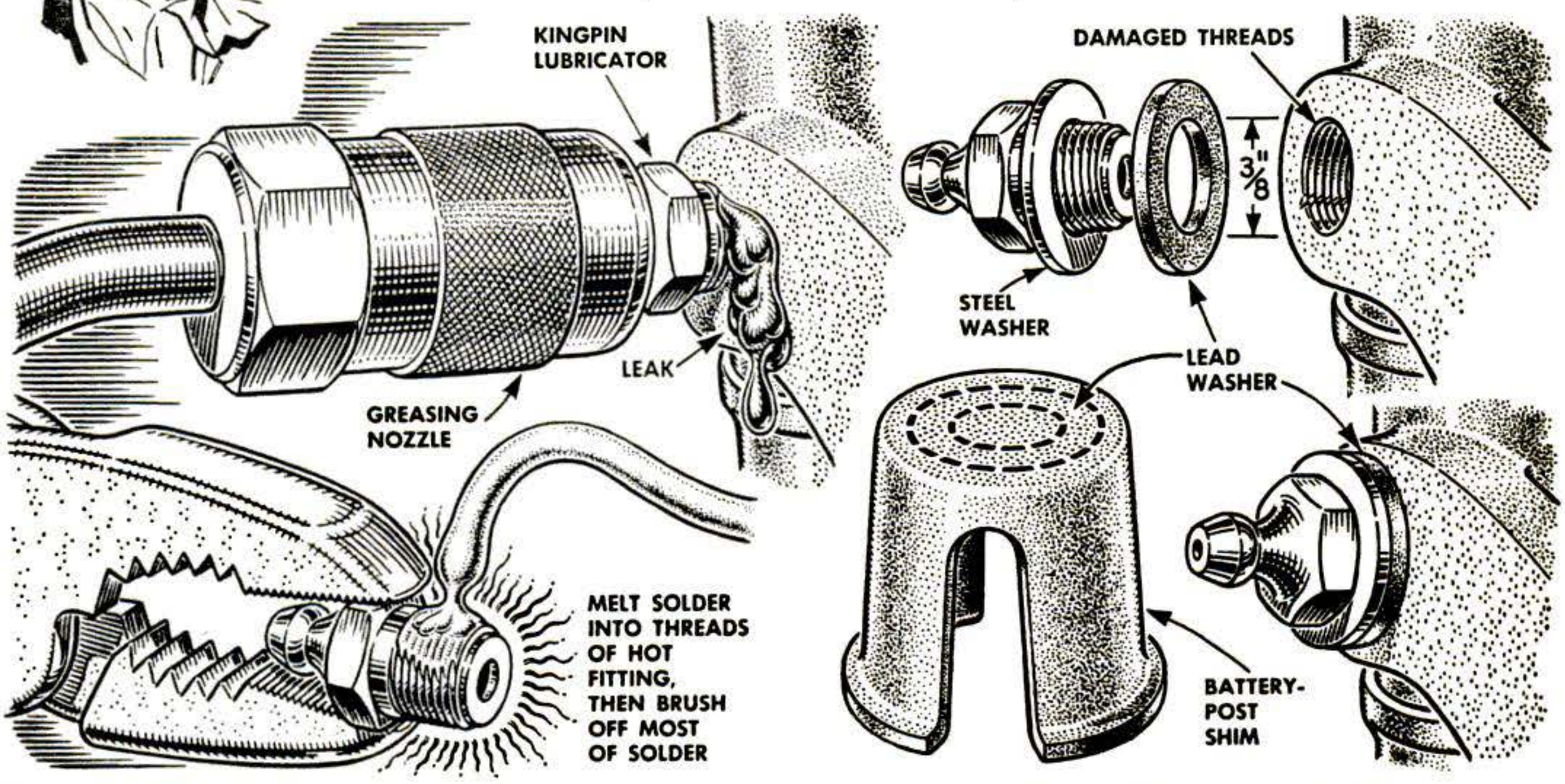
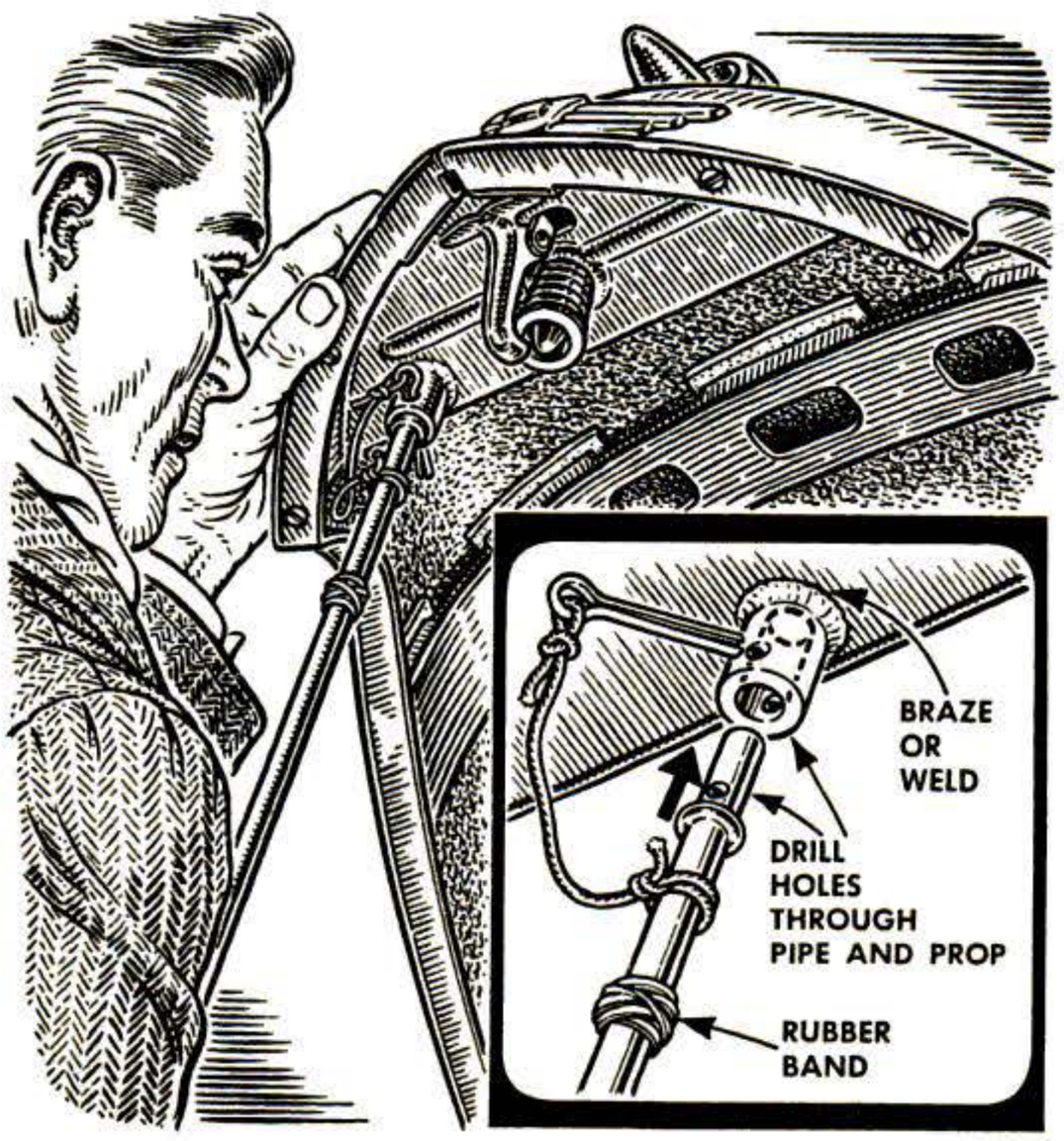
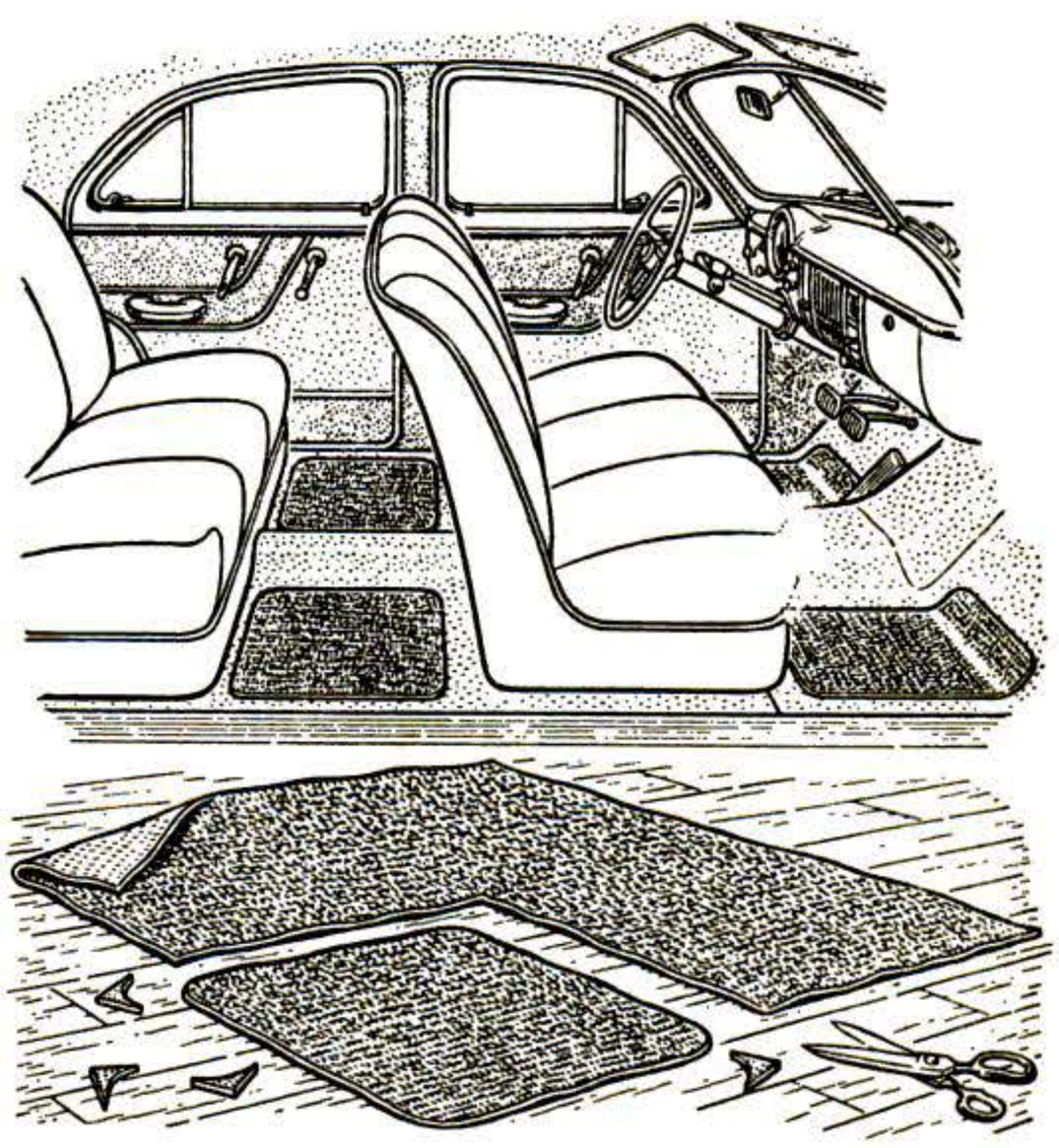
Hints from the Model Garage



Grease-fitting threads may allow a serious loss of lubricant if damaged. One mechanic has found that this often occurs when new kingpins are installed. In such cases, he removes and heats the fittings, melts solder on the threads and brushes off the excess as at left above. Another sealing procedure, shown at right, consists of cutting a lead washer from a battery-post shim and clamping it under a steel washer.



A gust of wind may whip up a raised hood, freeing the prop and allowing the hood to crash shut. A short piece of pipe brazed or welded under the hood is a safety feature to prevent this. Use a rubber band to hold the cotter pin while not in use.



Floor mats cut from an old rug are an economical way of replacing worn-out rubber mats. Cutting off the corners helps prevent fraying and raveling. Most of the sand and dirt lodged in the rug mats can be removed by periodic shaking.

Please turn the page for more auto hints.

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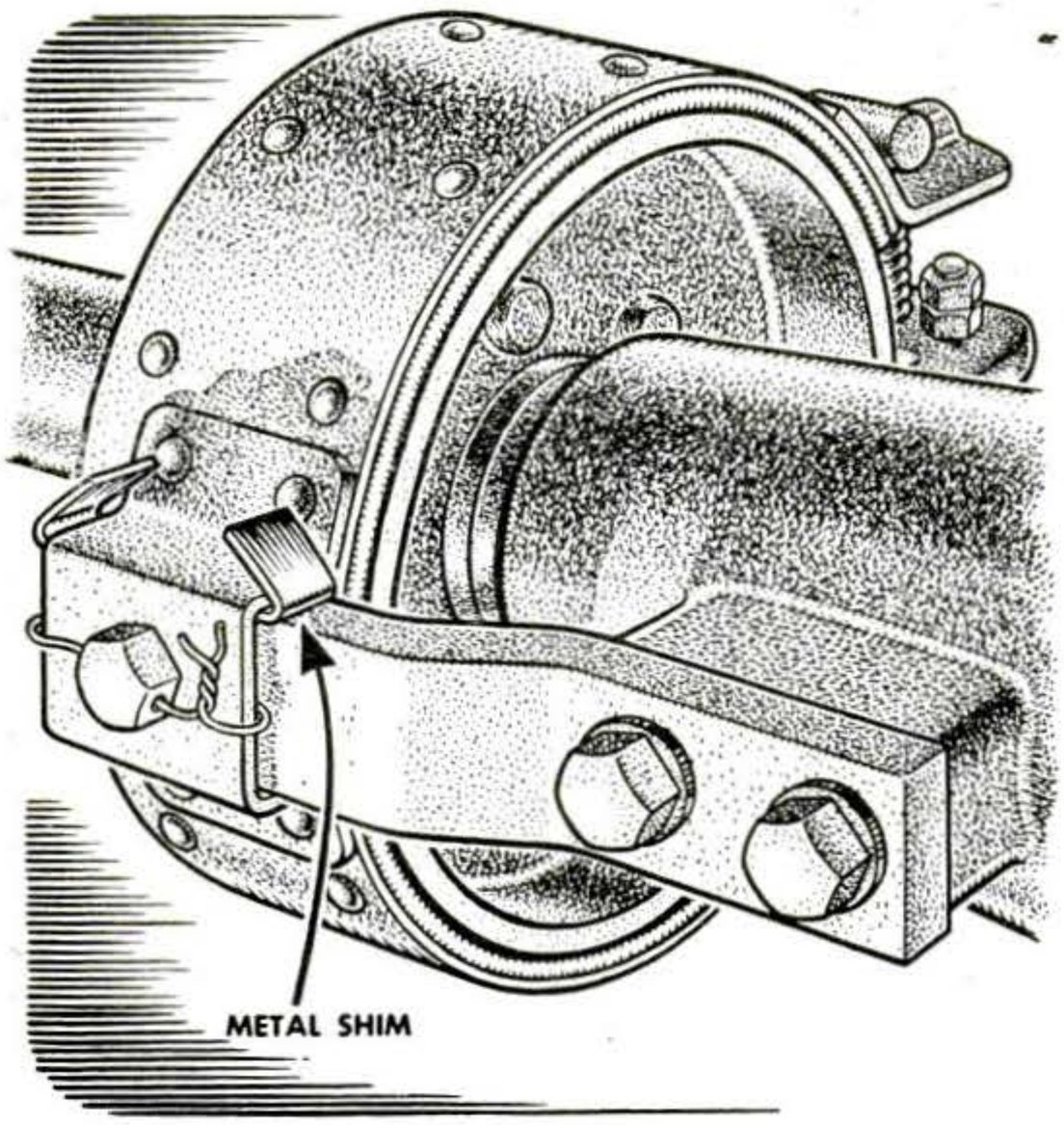
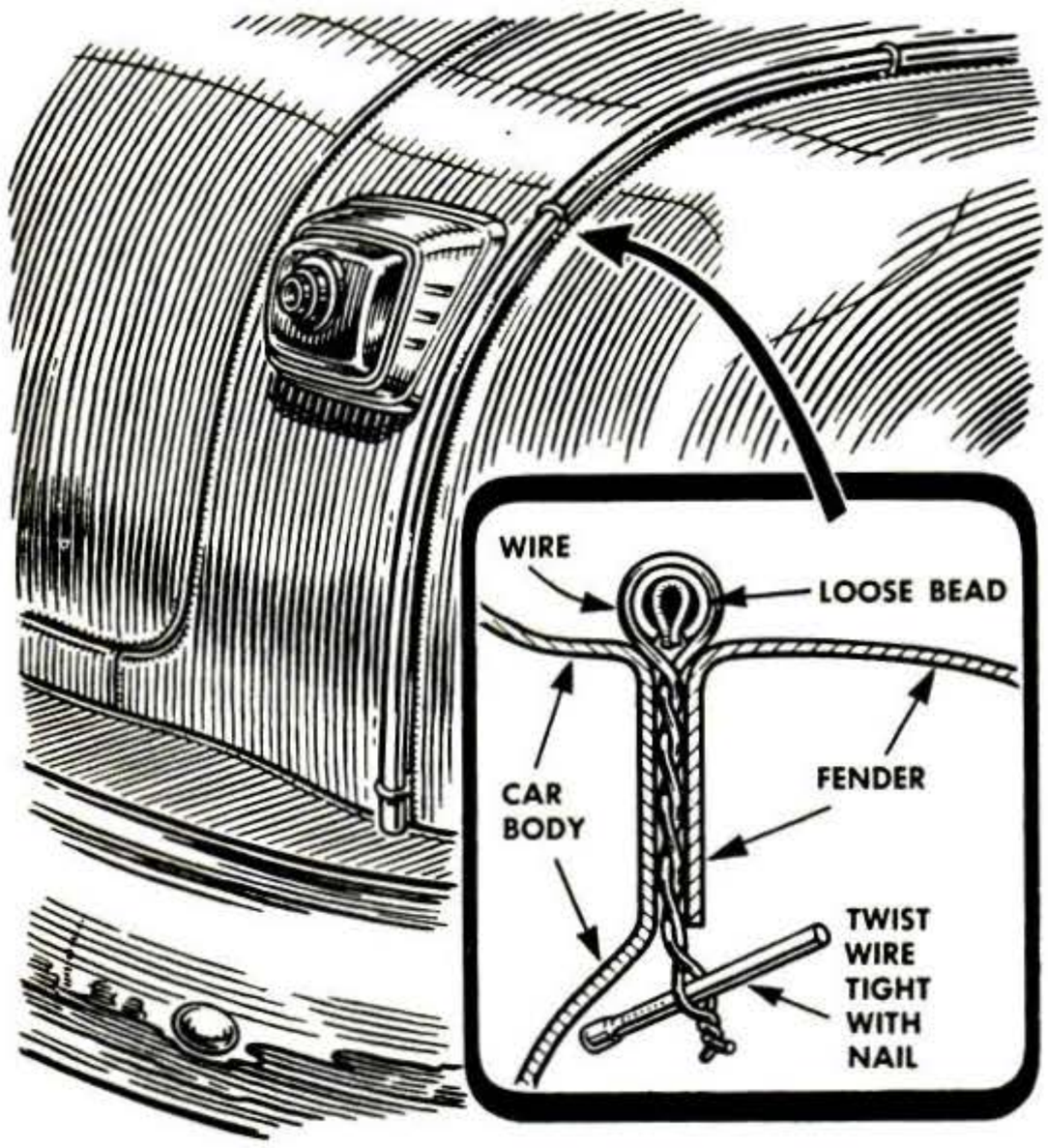
MORE Hints from the Model Garage



For adjustment of long-used Chrysler-type parking brakes, one mechanic inserts a shim between the band and the anchor strap, bending over the shim ends. This keeps band and drum aligned vertically and allows close adjustment without dragging.

A discarded plastic tablecloth makes an ideal temporary seat cover when you must drive in dirty and greasy clothes or while you are doing a car-repair job. The next time you see one in a trash barrel, rescue it and store in the luggage compartment.



If the beading pulls away from the joint between body and fender, you can pull it back in place with a short piece of soft, noncorrosive light-gauge wire, perhaps Monel. Put a nail through the looped wire under the fender and turn to tighten.

A durable antifreeze tag for attaching to the radiator can be made by cutting the brand name from an empty can. Paper tags ordinarily used to show what's being used and warn against draining have a habit of falling to pieces if they become wet.

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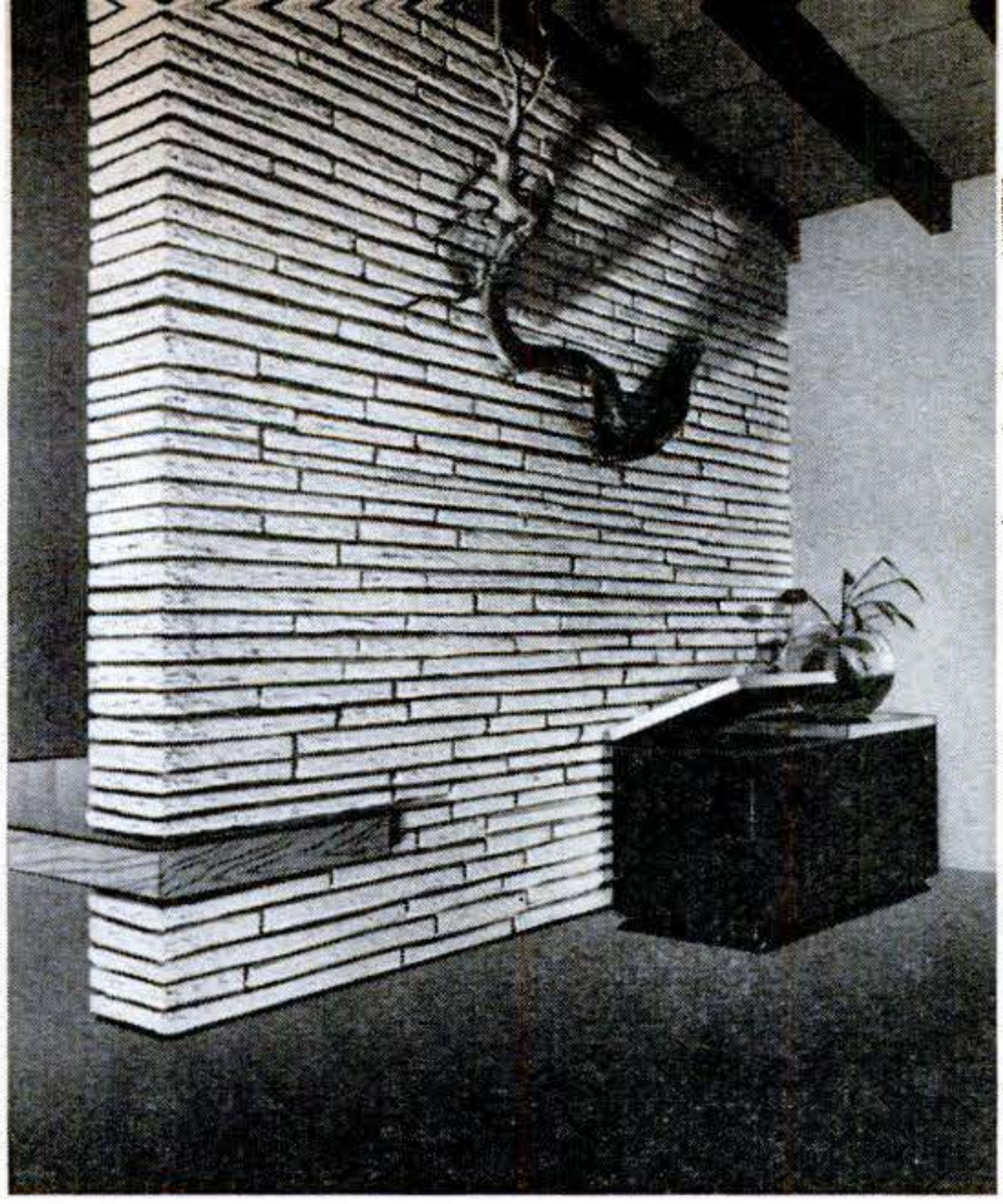
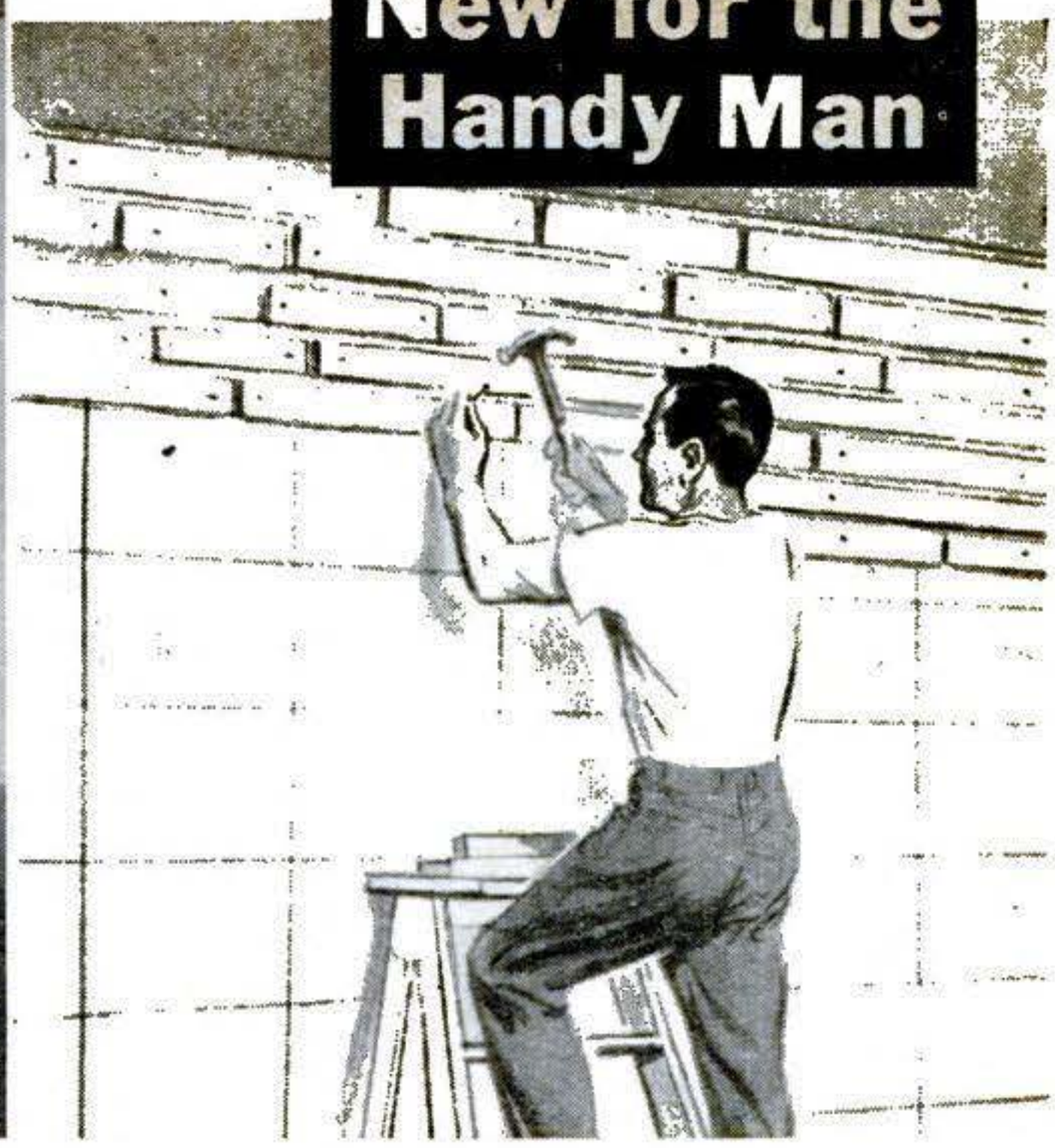
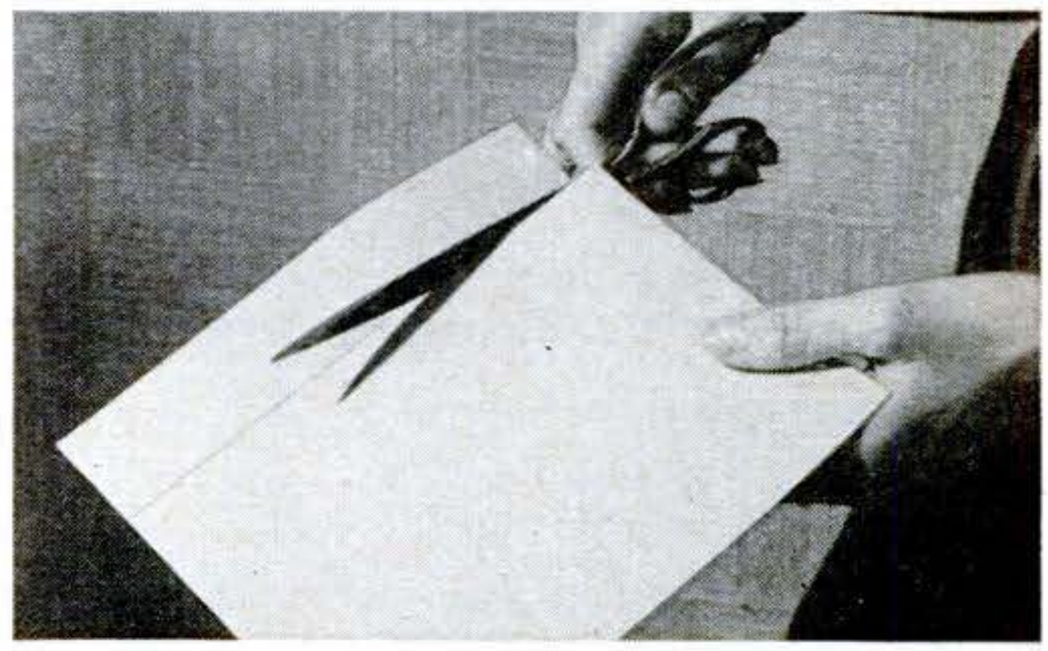
New for the Handy Man





1. "Stone" Wall Brushed On. You can give a wall the look of flagstone or brick without the cost, weight or labor involved in masonry. A ready-mixed, plaster-like compound is brushed over scrap-wood strips nailed to the existing wall in the desired design. The compound comes in a beige color, but may be tinted or painted.

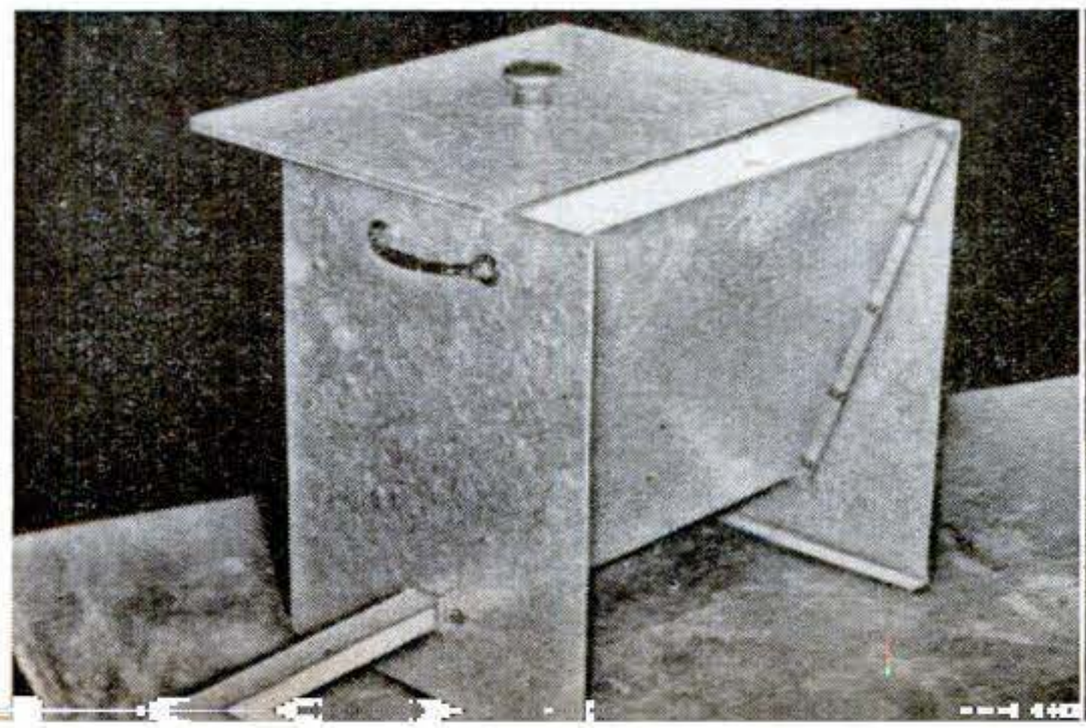
2. Weather Strip Sticks On. You don't need a single tool to install this bronze weather stripping—just pull the protective paper off the adhesive-coated back and press the stripping into place where you want it. Kel-Eez comes precut to fit standard doors and can be bought by the foot for installation around windows.

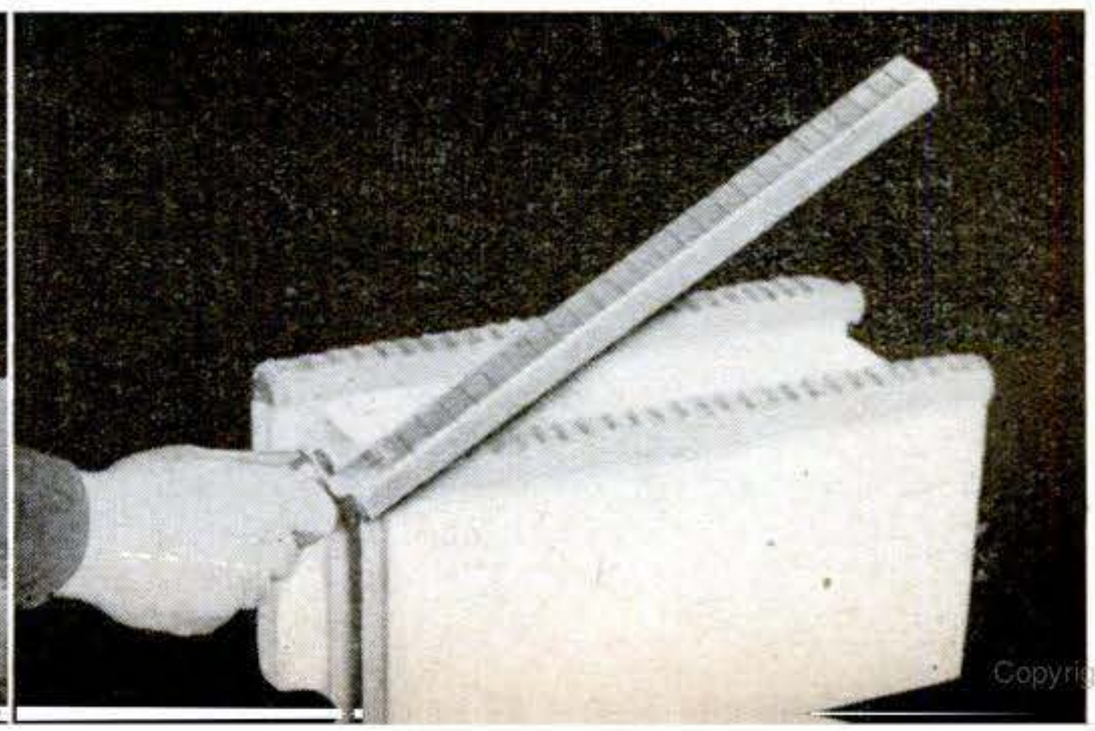


3. Plastic Tile Is Flexible. Textured to resemble bamboo, new plastic wall tiles can be cut with scissors and bent around sharp corners. They can be set with adhesive over plaster, wallboard or plywood.

Further information on these products can be obtained from: 1. Huntstone Co., Box 953, Beverly Hills, Calif.; 2. Kunkel Products, 326 S. Main St., Akron; 3. Bolta Products Sales, Lawrence, Mass.; 4. John Lamm, R.D.2, Box 205, Kent, Ohio.

4. Trowel Measures Mortar. Getting the right amount of mortar in the right place is easier with a channeled trowel that holds a ribbon of mortar 1″ square by 16″ long—just right for one concrete block. The Speed E-Z is filled by inserting it in a hopper dispenser, emptied by up-ending it along the edge of the masonry.





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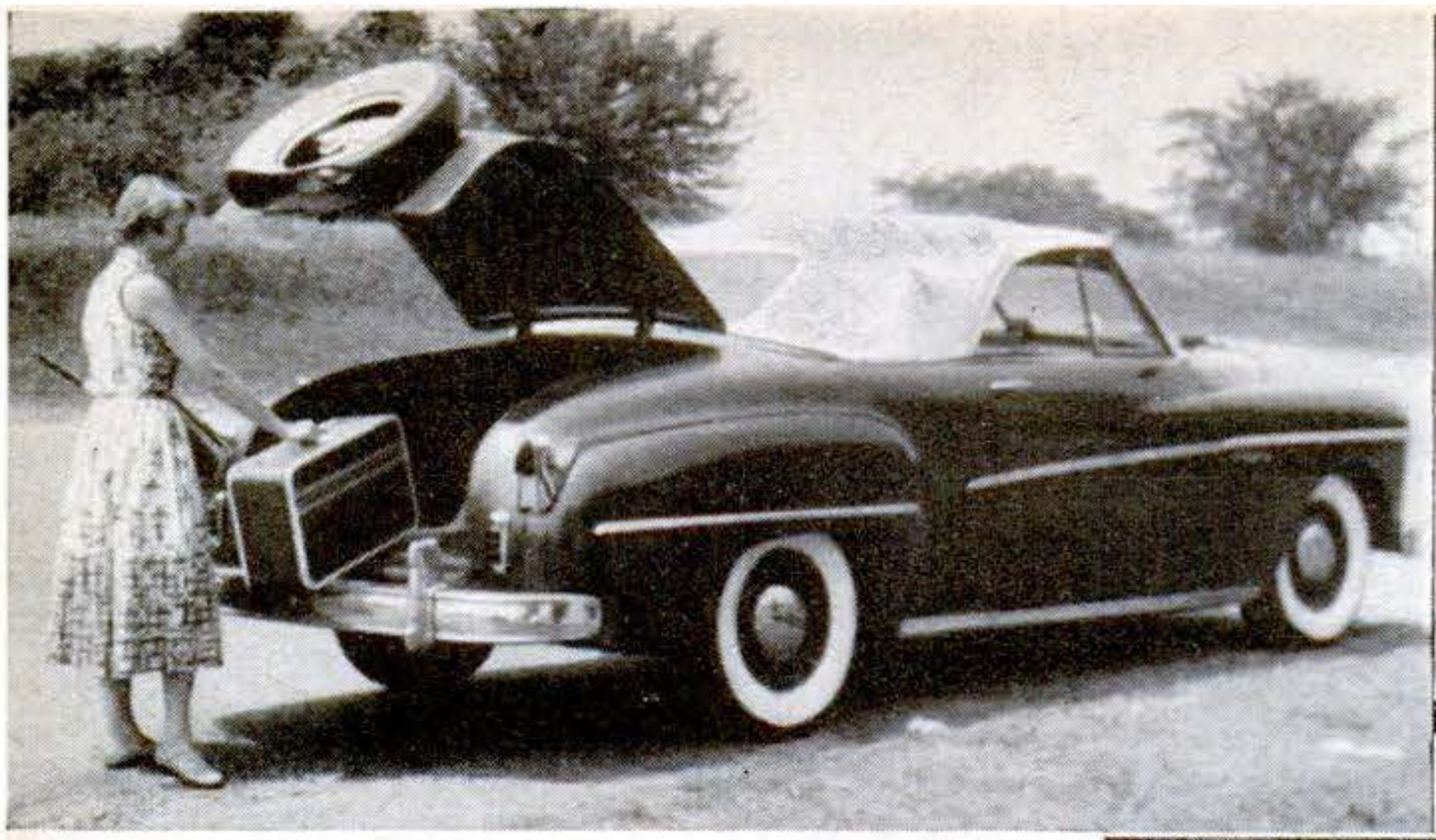
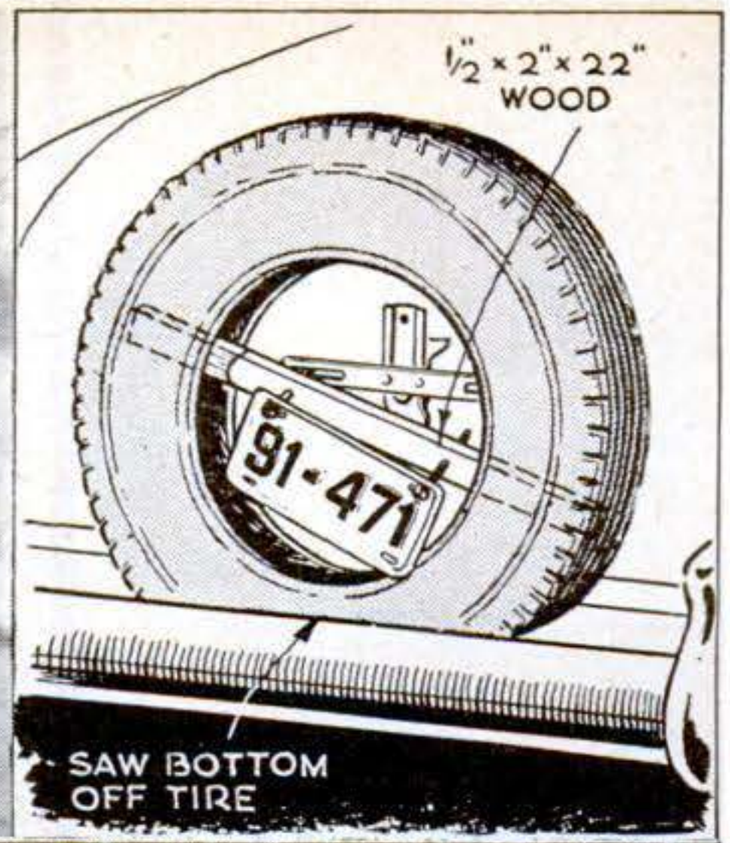




Dummy Tire Gives Custom Look

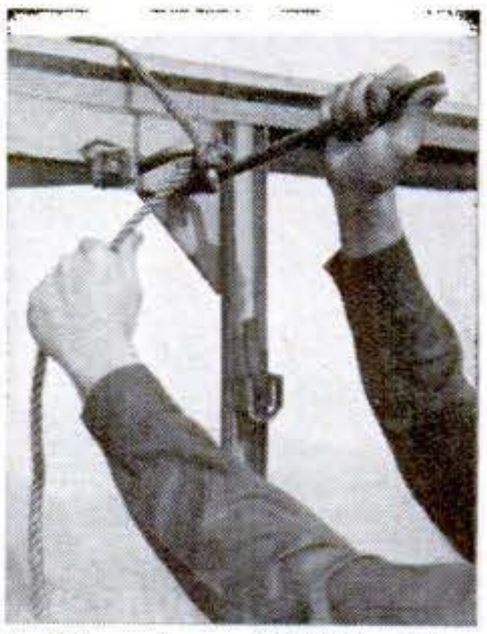
CAR owners who like the stylish look of the old Lincoln Continental can have it at practically no cost. I used a discarded 6.70-by-15 tire that had worn smooth, a stick of wood, a chrome wheel-rim insert for a 6.00-by-16 tire and two 4″ bolts.

I sawed off the bottom of the tire to rest flat on the gravel shield, giving the appearance of being recessed in the shield. Next I drilled two holes in the wood to match those in the license bracket on my 1949 Dodge and inserted the stick in the tire as shown in the sketch. I then bolted this assembly and the license to the bracket on the deck lid. After cutting the rim insert, I sprung it into place on the tire bead and painted the tread area of the tire black. —*A. W. Baldwin, Washington, D.C.*

Bracket Holds Trouble Light

TO KEEP my automobile trouble light within easy reach, I screwed a cup hook into the side wall under the dash and hung the light on it. The handle is held by a radio-tube clamp, and the cord wound neatly on a cleat bent from 20-gauge aluminum. I also cut off the plug that fits the lighter socket and wired the light permanently to a hot terminal and ground. The light is ready for instant use. —*Philip E. McCafferty, Fort Bliss, Tex.*

Tightener Ropes Wood to Truck



TO TIE lumber safely atop a rack on a pick-up truck, a California contractor designed the quick-acting rope tightener at the right. The rope is half-hitched around a short projection welded on the rack cross bar. The swinging U is then levered down for tightening. With the U past lower dead center, rope tension locks it, but for extra safety a pivoted bar on the supporting post drops over to keep the lever from swinging back.

Outboard Can Fuels New Car

You can't pour gas into some of the new cars that have a horizontal filler pipe at the rear. In the event I run out of fuel I carry an outboard-motorboat fuel can. It has a hose that can be pushed into the filler pipe. —*Harry Gottlieb, NYC.*

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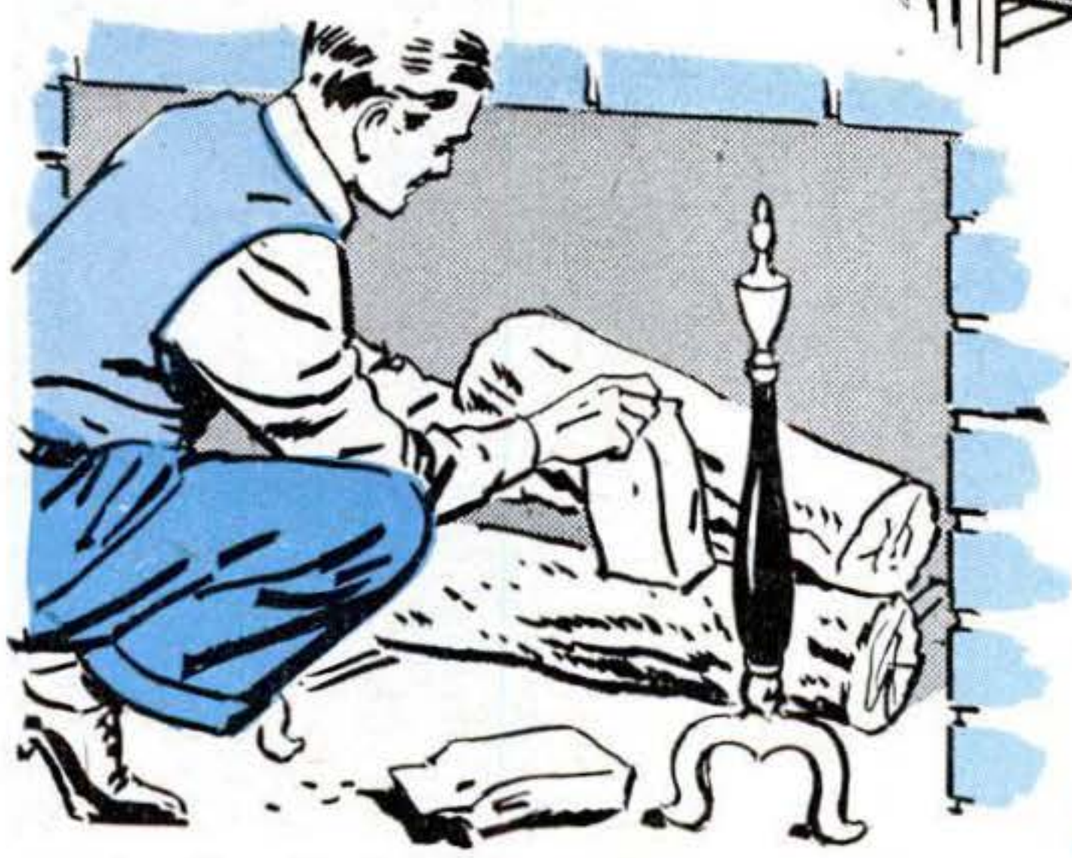
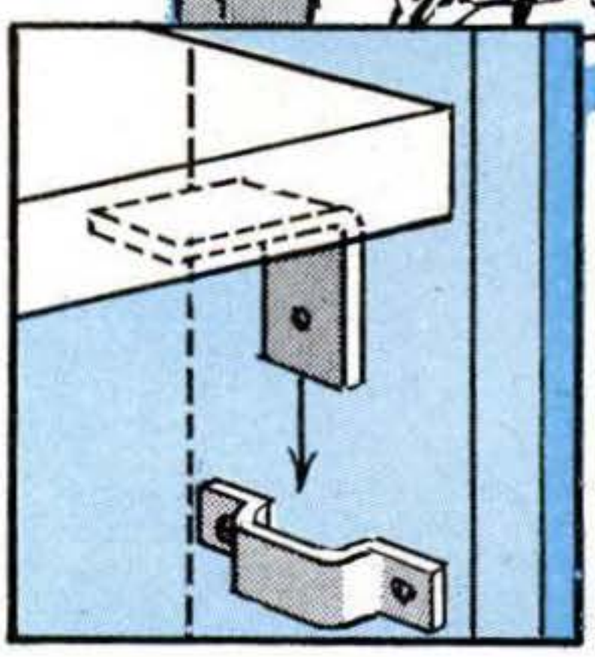
KEEPING THE *Home* SHIPSHAPE

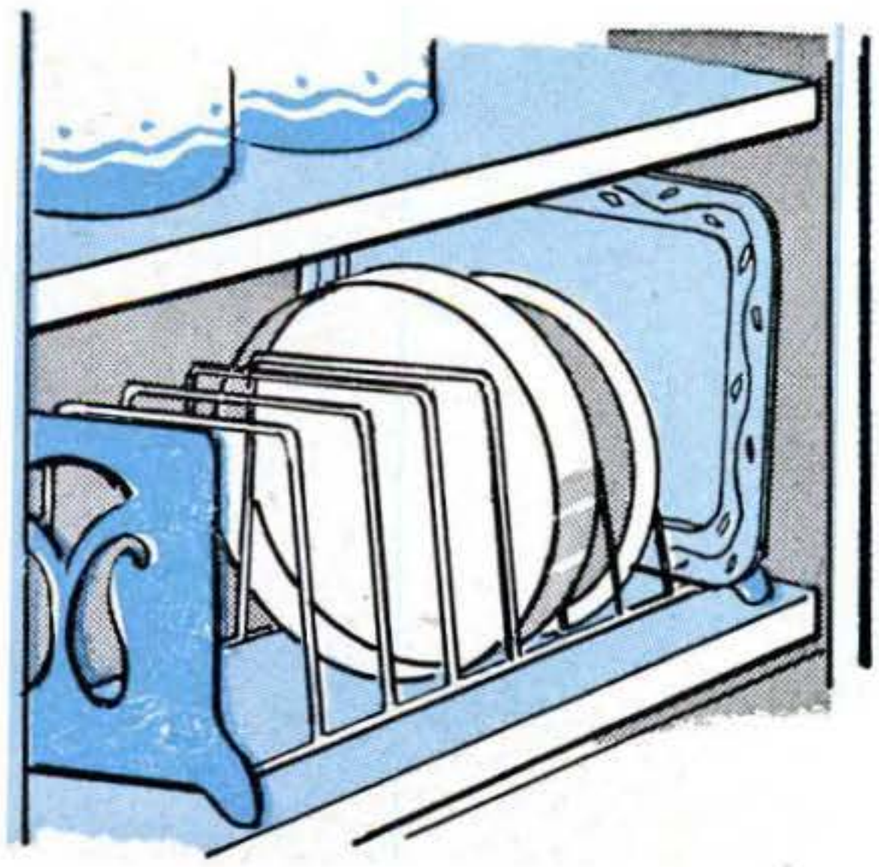
Top-drawer typing puts the work at a more comfortable height than the desk top. Empty the drawer, turn it upside down, insert part way into the recess and support with a T-shaped brace.



Tinder for the hearth can be a by-product of the workshop. Gather up sawdust, shavings and odds and ends of wood in small paper bags and tuck a bag or two between the logs when you start a fire.



A bedside screen is a table, too, if a plywood triangle fitted with angle brackets is slipped into U brackets on the screen. Latter can be formed from mending plates.



A record holder makes a good rack to keep trays and flat pans upright in a kitchen cabinet.

No fishing is necessary if small parts go into cleaning fluid locked in a percolator basket. A rubber band and two matchsticks will anchor the lid.

Please turn the page for more home tips.

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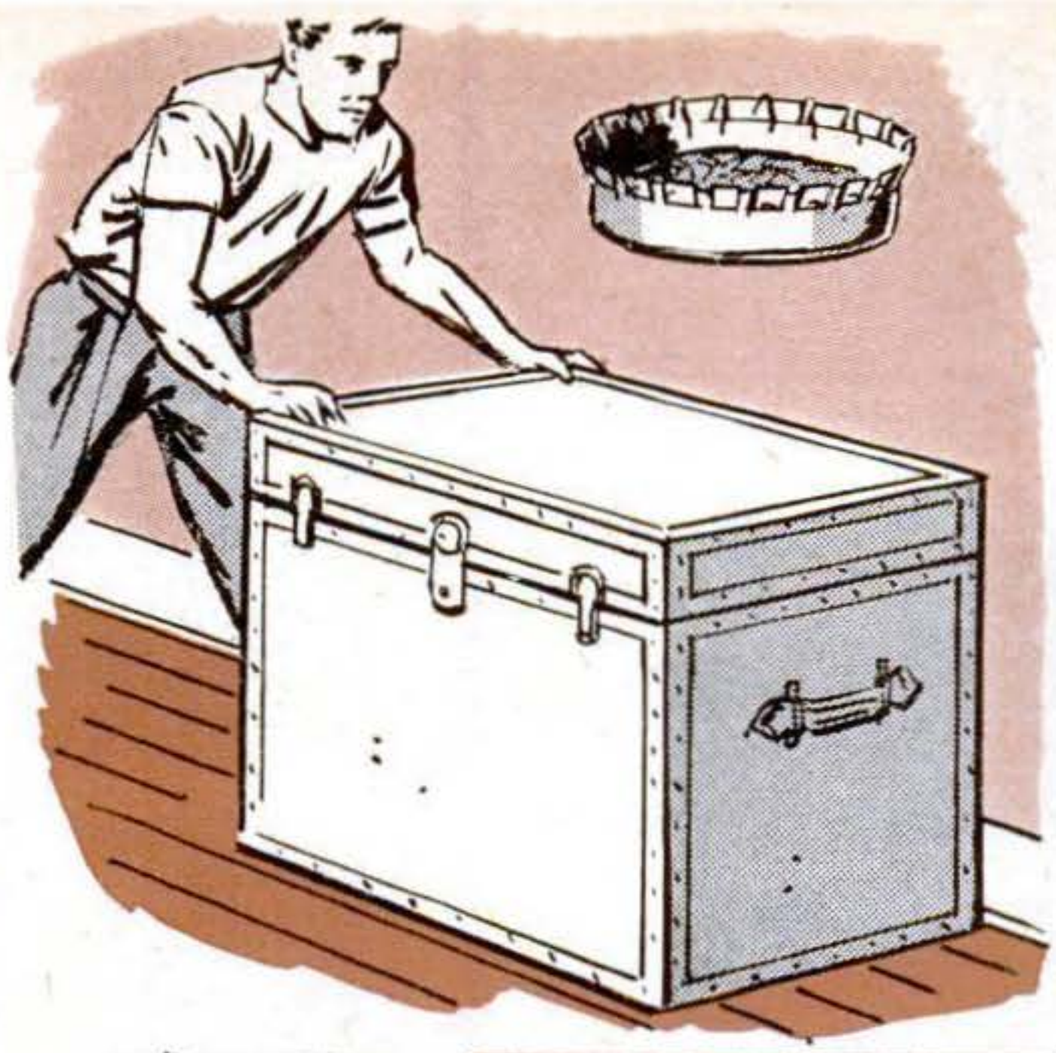
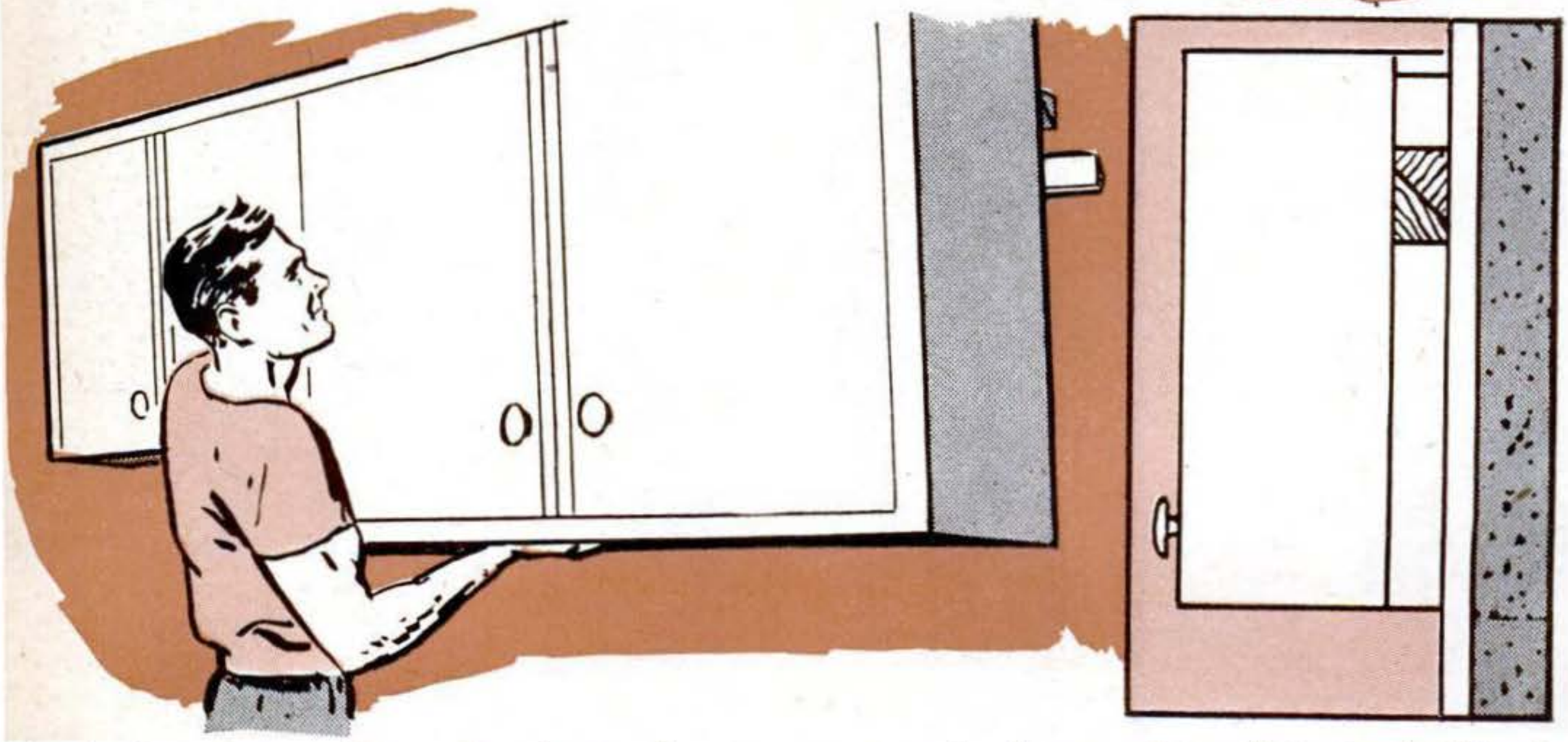
More Home Tips

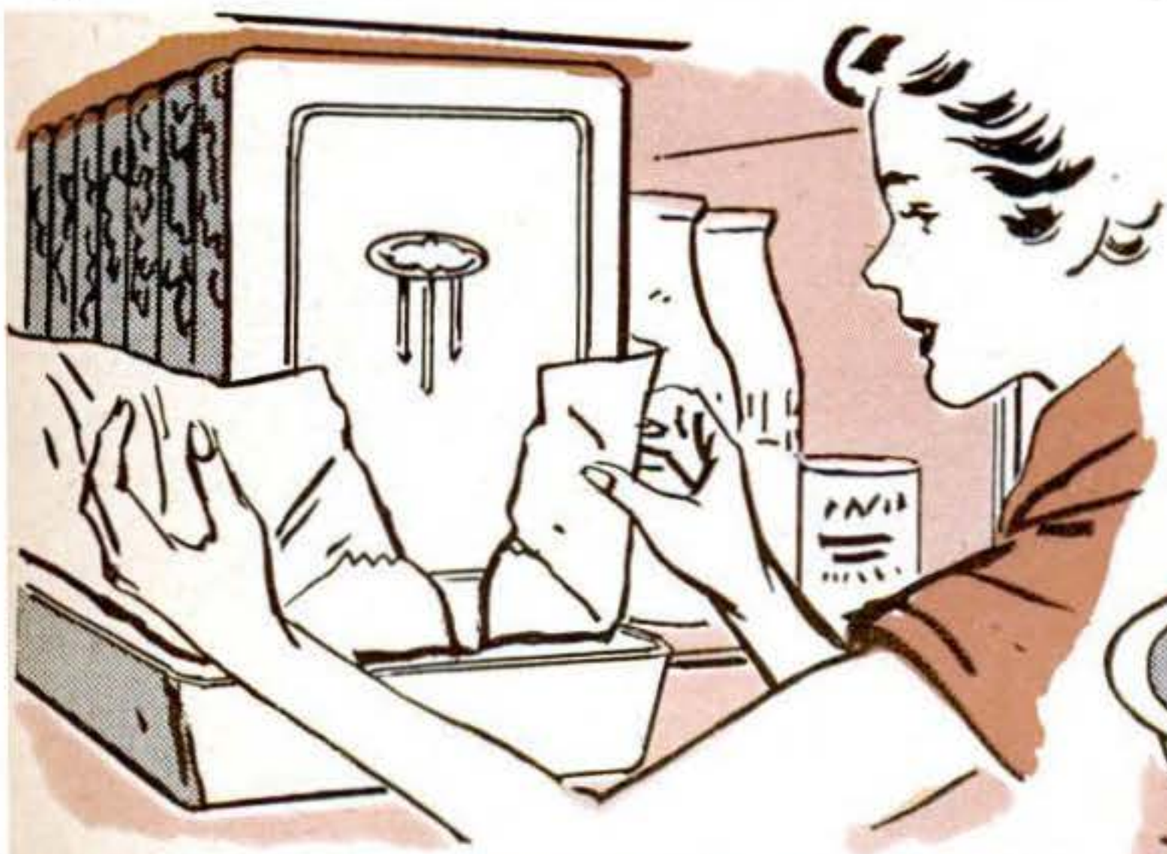
When wet sanding or removing paint from flat surfaces, an old windshield-wiper blade is handy for scraping away the sludge. It also helps show up unevenness in the surface.



Save your back by slipping bottle caps, crimped side up, underneath heavy trunks and cases. Then slide the load along the floor instead of lifting it.



Tip for hanging a cabinet: Bevel a wood strip to 45° and nail to cabinet back with bevel facing down. Level a matching strip on wall, bevel up. Lift cabinet, slide down wall until bevels meet, nail cabinet and it will be level. If back is not recessed as shown, add strip near bottom edge to keep cabinet vertical. Place strips over gaps to seal out dirt.



To defrost a refrigerator without flooding the shelves, tuck a sheet of plastic or a cut-open paper bag around the freezing unit to funnel water and ice into the drip tray.

A cold house may be due to clogged air valves that keep steam from entering radiators. Soaking the valves in carbon tet will clear them of oil and dirt.

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The Why, What, Where and How of Home Insulation

Here is why you should have it, what you should buy, where and how to place it.

By Paul Corey and Darrell Huff

THE remarkable thing about insulating your house is that eventually it won't cost a cent. The money you put into it will come off your fuel bill, usually within just a few years. You'll also pick up a bonus in free comfort every month of the year.

From University of Illinois figures you can calculate how quickly insulating your home will pay for itself. Savings should stack up like this:

- One-story frame house: walls, 13 to 15 percent of your annual fuel bill; ceilings, 22; storm sash, 15.
- Two-story frame house: walls, 19 to 23 percent; ceiling, 13; storm sash, 18.
- Most masonry houses: savings are substantially greater because of their heavier heat loss through uninsulated walls.
- Summer air conditioning: your savings will be even greater.

Where to begin? Usually the first thing to insulate is the ceiling. It is easiest to get at. Each dollar put into insulating overhead will save you more on fuel than if it were spent on side walls.

Ceiling insulation also helps a lot in keeping the house cool in summer.

Whatever your insulating problem, there are probably several products made to solve it. No one kind is best—but there may be one that will do more for you than any other for each dollar you spend. The "how to buy and apply" chart on the following pages is your guide in this.

Many types available. For insulating a ceiling from above you have a wide choice. You'll find what you want among the loose fills, blankets, batts, reflective or combination types.

Perhaps you want to insulate side walls in an existing house without disturbing the present walls. That calls for one of the loose fills. Where studs are accessible, you can use one of the other types.

If you want to get a moderate amount of insulating value along with finished walls or ceilings—all at low cost—use one of the insulating planks, boards or tiles.

One big problem goes along with insulating a house—controlling the moisture that causes destructive condensation. So read about this on page 210 before selecting your insulation.

Please turn the page for more about insulation.

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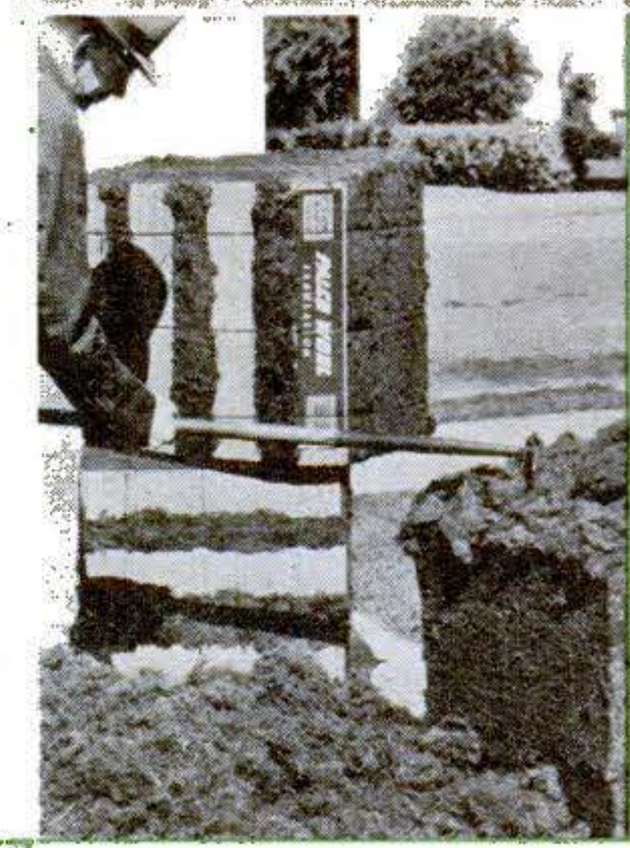
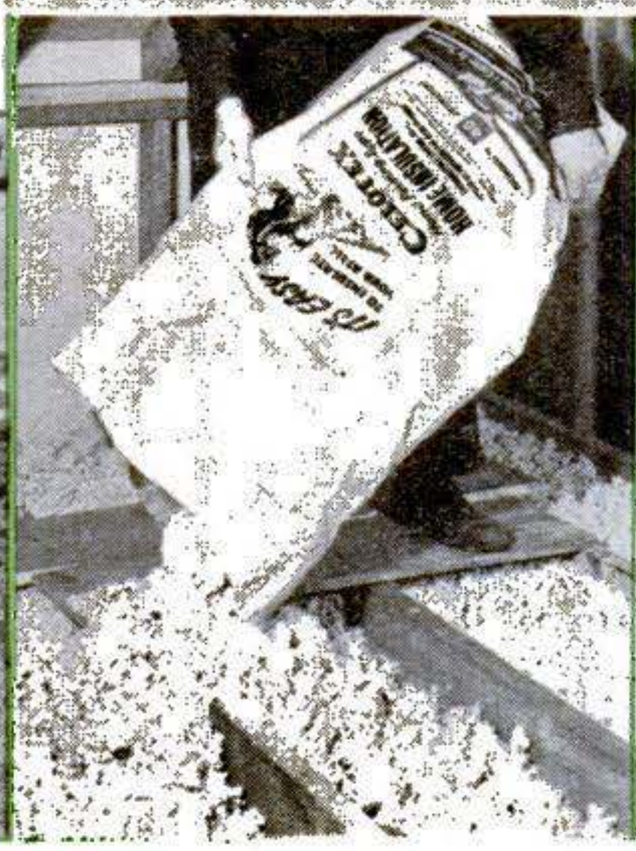
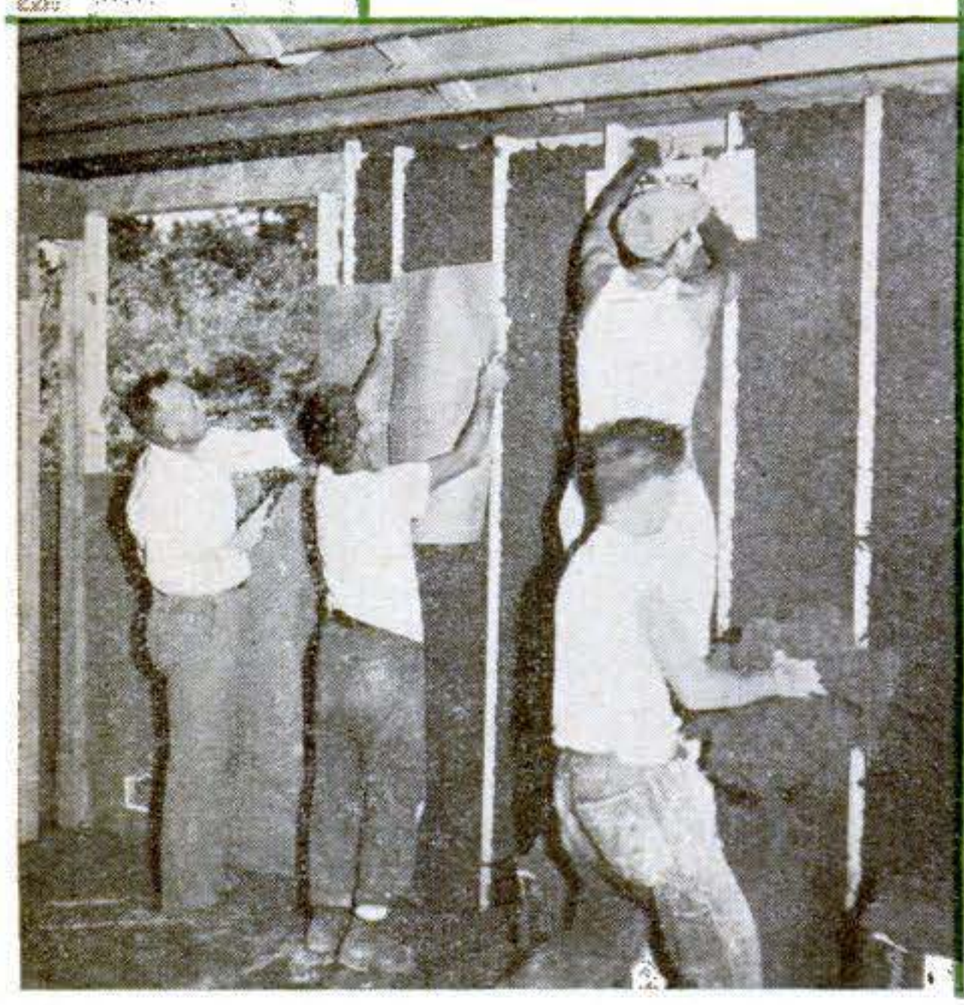
LOOSE FILL





Description	WOOD FIBER comes in bales, expands when opened.	MINERAL WOOL (rock, slag or glass) comes in sacks.	VERMICULITE is expanded mica. It comes in bags.
Good type for . . .	...spreading on attic floors; packing between wall studs.	. . . pouring onto attic floors where insulation usually is needed most. May be packed into irregular spaces and around pipes. Mineral wool and vermiculite are excellent for insulating walls of existing homes.	
Advantages	Can fill wall space completely, giving extra insulation and fire protection.	Usually least expensive and most widely available. Easy to use.	Very easy to pour. Excellent for filling hollows in masonry walls.
Drawbacks	Provides no vapor barrier. Not so widely available as some other types.	May irritate skin or sinuses when being used. Provides no vapor barrier.	Provides no vapor barrier. May be slightly more costly than some loose fills.
How to use it	Pack between joists or studs, as below. Vapor-barrier paper may be added if needed.	For ceilings, pour insulation as shown below. Rake it level with tops of joists or to uniform lesser thickness with home-made cardboard tool. To fill walls of existing buildings, remove siding and sheathing at top of wall and under windows to pour.	



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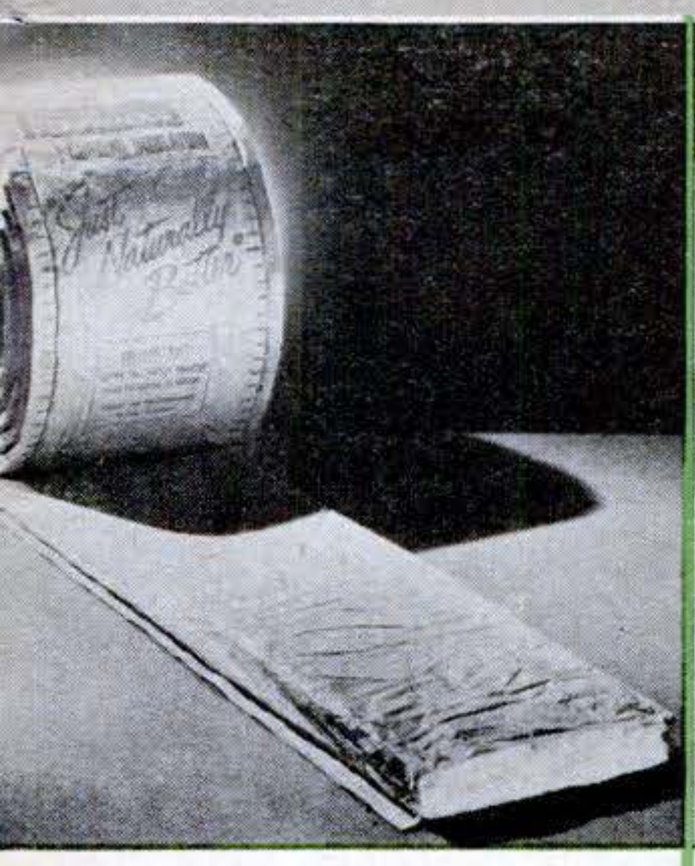
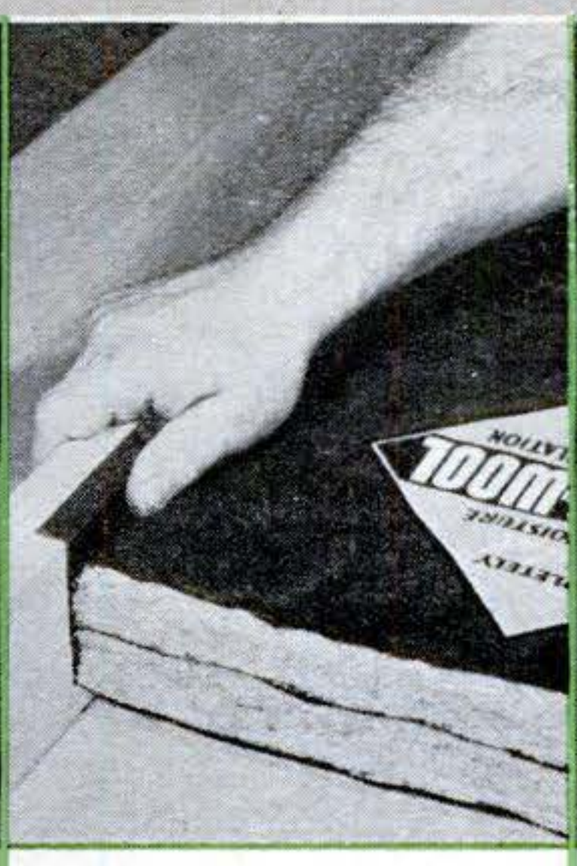
BLANKET



MINERAL-WOOL blankets may be rock, slag or glass wool.



WOOD-FIBER MATT comes in long rolls completely enclosed in paper.

COTTON insulation comes as a flameproofed blanket.

FIBROUS BLANKET is sold as a compressed roll.

. . . use where framing is exposed. All blanket types may be used over ceilings, inside rafters, or between studs in side walls. Rolls may be cut to whatever lengths are needed and then installed in continuous lengths without joints, providing an unbroken barrier to heat and moisture.

Inexpensive, widely available, give continuous vapor barrier.	**Efficient, made in variety of widths for different stud spacing.**	**Lighter weight and higher efficiency than most types. Very clean to use.**	**Compact to carry, non-irritating, easy to cut and handle, may be cut to odd widths.**
Must be cut to size. Particles may irritate skin or nose during installation.	Necessity of cutting makes blanket type less convenient for short lengths.	Somewhat more expensive to buy than most insulations.	Ordinary type may need added vapor barrier in cold climates. (Reflective type has barrier.)

Staple or tack into place between rafters, studs or joists. For greatest efficiency insulation should bow in enough to form an air space between blanket and wall on each side. Center picture below shows how the nailing flange on the edge of most blankets forms a continuous vapor seal.

First expand by pulling to full length. Then cut and install like other blanket types at left.

Please turn the page for more about insulation.

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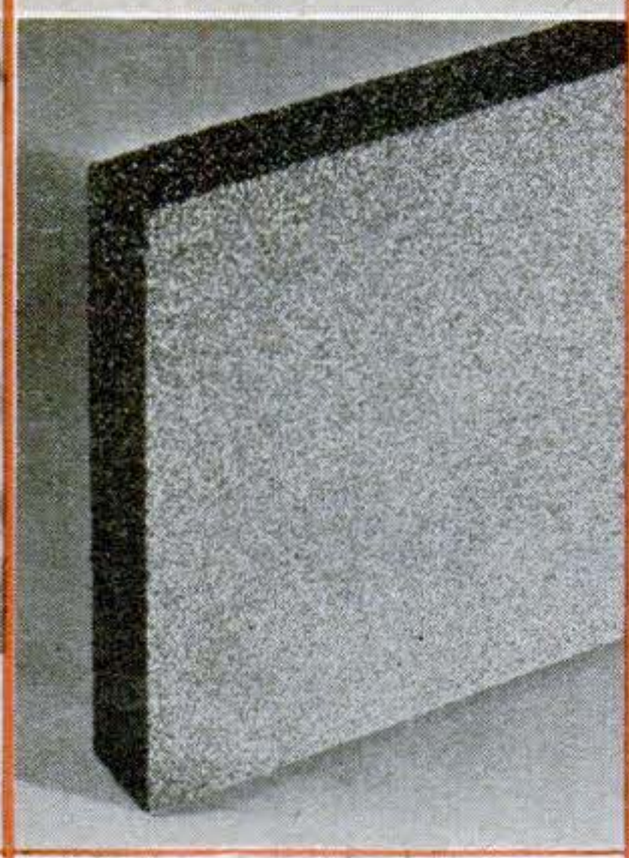
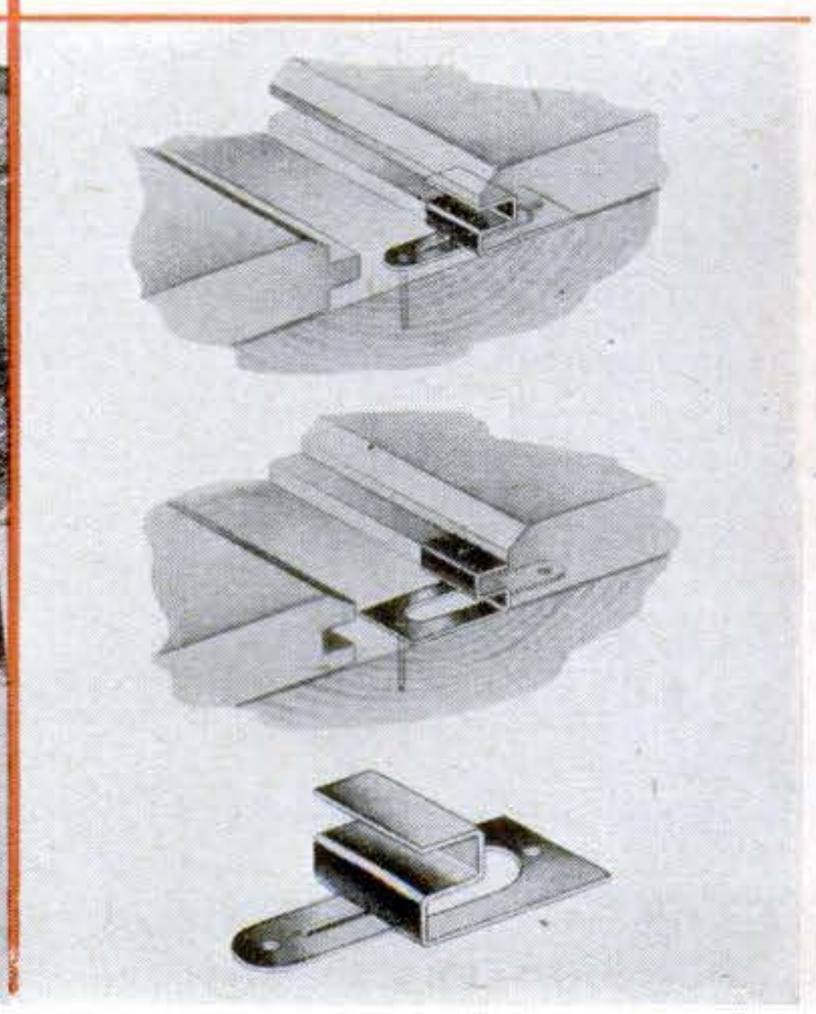
INSULATION

	BATT	RIGID	BOARD
			
Description	MINERAL - WOOL batts may be glass, rock or slag.	CELLULAR GLASS or asphalt - impregnated fiberboard.	STRUCTURAL insulation may be board, plank or tile.
Good type for . . .	. . . walls, ceilings and roofs where framing is spaced to fit standard batts.	. . . use around foundations, under edges of slabs, under built-up roofs.	. . . rooms where wall and some insulation are wanted at modest cost.
Advantages	Widely available, inexpensive, cut to size; vapor barrier usually is built in.	Stiffness and moisture resistance permit use where other insulations are not suitable.	Inexpensive, produce a new wall or ceiling in an unfinished room, give some insulation.
Drawbacks	Barrier is not continuous. Types not fully wrapped may shed irritating particles.	Glass type is more expensive. Board type offers less insulating value.	Do not usually have enough insulating value to use alone in cold climates.
How to use it	Lay between joists of attic floor. Or nail or staple to studs, using flange attached.	Interior: fasten to masonry wall with asphaltic cement. Exterior: place against foundation before backfilling as shown.	Fasten with nails, staples or special clips shown below. Board types call for battens at joints.
			

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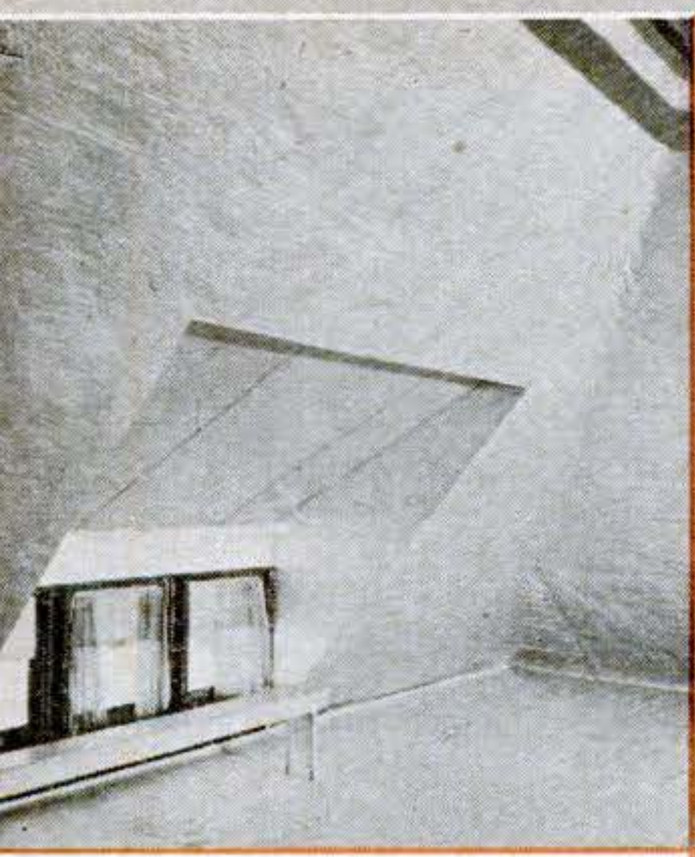
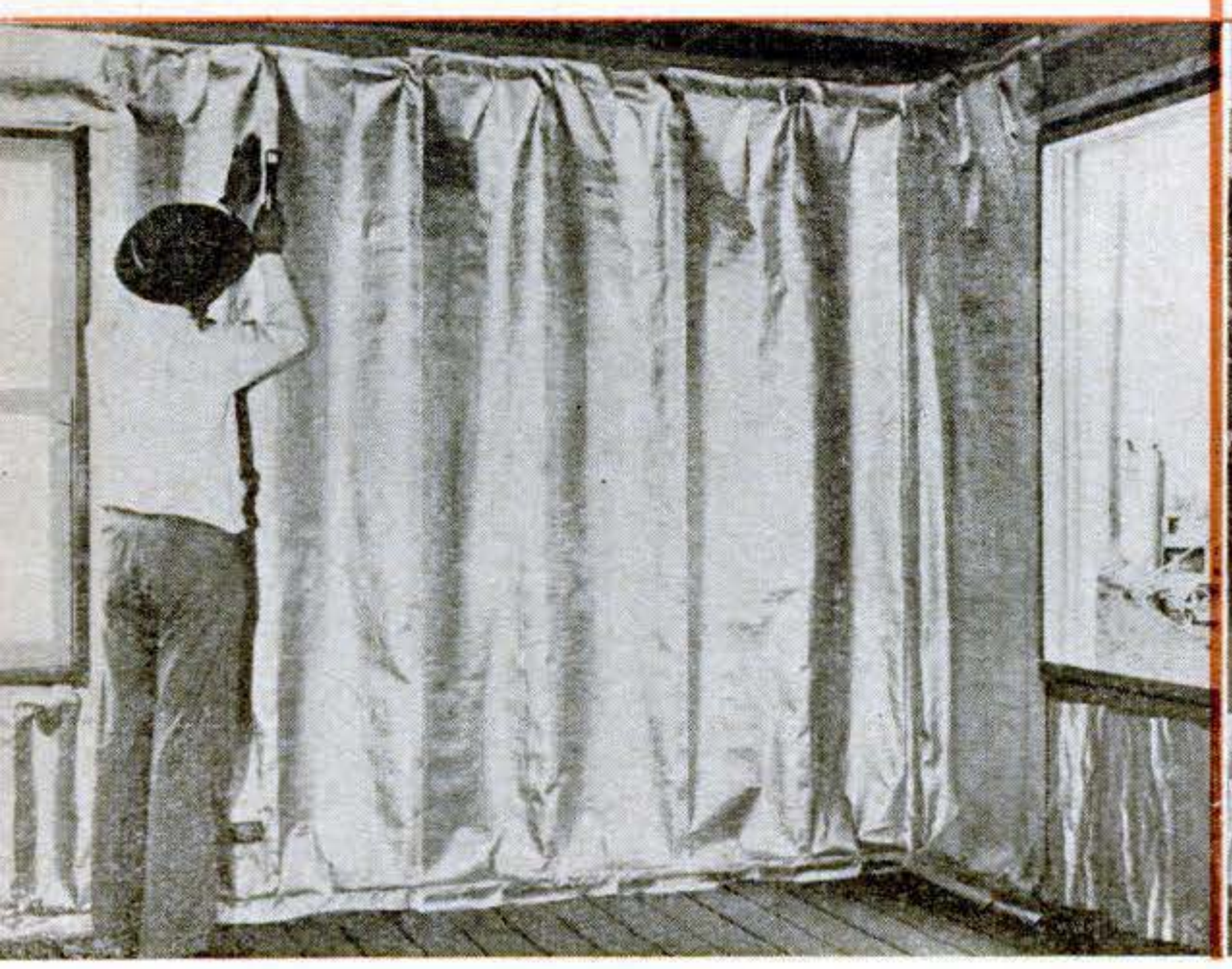
REFLECTIVE			COMBINATION
			
ALUMINUM powder (dull) building paper.	ALUMINUM FOIL in rolls (surface is shiny).	MULTIPLE FOIL in two to four layers comes in rolls.	BLANKET WRAPPED in aluminum foil for double action.
. . . walls or under roofs where stout paper with some reflective value is wanted.	. . . insulating ceiling against heat of summer sun.	. . . anywhere that framing is accessible. Especially good in hot climates.	. . . anywhere blankets will go. Top choice where temperatures are extreme both summer and winter.
Excellent vapor barrier and weather seal plus some insulation—at low cost. Tough, easy to use.	Excellent vapor barrier. Moderate cost. Very efficient against heat from above.	Light and compact to carry, clean to handle. Small bulk lets house cool quickly in summer.	Insulation is fully protected, with vapor barrier. Foil reflects radiant heat, bulk stops conduction.
Usually not adequate insulation by itself. Gives less soundproofing than bulk types.	Less efficient at keeping heat in than keeping it out —especially in ceiling.	Cannot be installed after wall is finished. Costs more than many bulk types.	Combination type costs more than most bulk or reflective types alone.
Single-layer foil insulations can be tacked or stapled between studs or joists or over the faces of them. They should be bowed in to form two air spaces. Second layer may be added for more insulation.		With vapor barrier toward room, along one edge. Staple other edge after pulling to separate layers. Then staple ends.	Staple at sides (and preferably at ends too) between framing members. Method is same as for plain blankets.
			

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What You Can Do About CONDENSATION

The unseen moisture that can wreck a house has many sources. Here are some simple ways to prevent condensation damage.

By Martin Mann

GRANDPA probably never heard of condensation. If paint peeled, plaster stained or timbers rotted, he knew there was a leak in his house. Leaks we may still have, but today those signs of trouble can also point to condensation, an affliction most likely to be serious in new, tightly built, well-insulated homes.

What is it? People often call condensation sweat, or steam. You see it as drops of water on a cold-water pipe on hot, humid summer days or as fog on the bathroom mirror after a shower bath. The pipe and the mirror are relatively cold; the air nearby is warm and loaded with water vapor. When the warm, moisture-filled air is chilled by the cold surface, some of its invisible water vapor changes into visible liquid water. That's condensation.

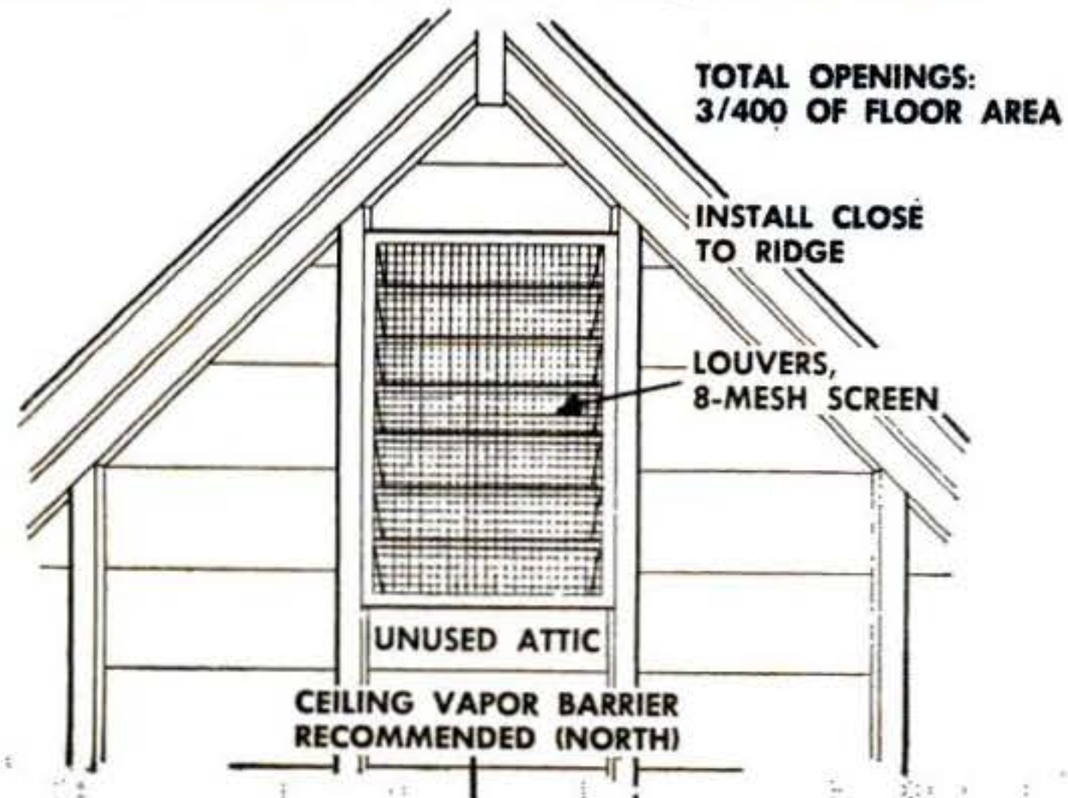
The condensation you can see on a mirror or pipe seldom hurts anything. It's the condensation you can't see that makes the trouble. Usually it is inside walls: warm, damp air passes through plaster or wallboard and hits the cold outside sheathing; the moisture vapor condenses to water on the inner surface of the outside wall. The water can soak through the outside wall and peel the paint, it can drip onto structural timbers and rot them, it can seep back through the inside wall and damage the finish or even break loose a section of plaster. Other danger areas are the underside of roof sheathing and the underside of flooring over a damp basement.

The moisture comes from everyday living: cooking, laundering, bathing, even breathing. In Grandpa's big, loosely built house it was easily absorbed or harmlessly leaked outside. Modern houses are small and tight. Usually they are insulated, which aggravates the problem by making inside walls warmer and outside walls colder and thus increasing the chance of condensation within the walls.

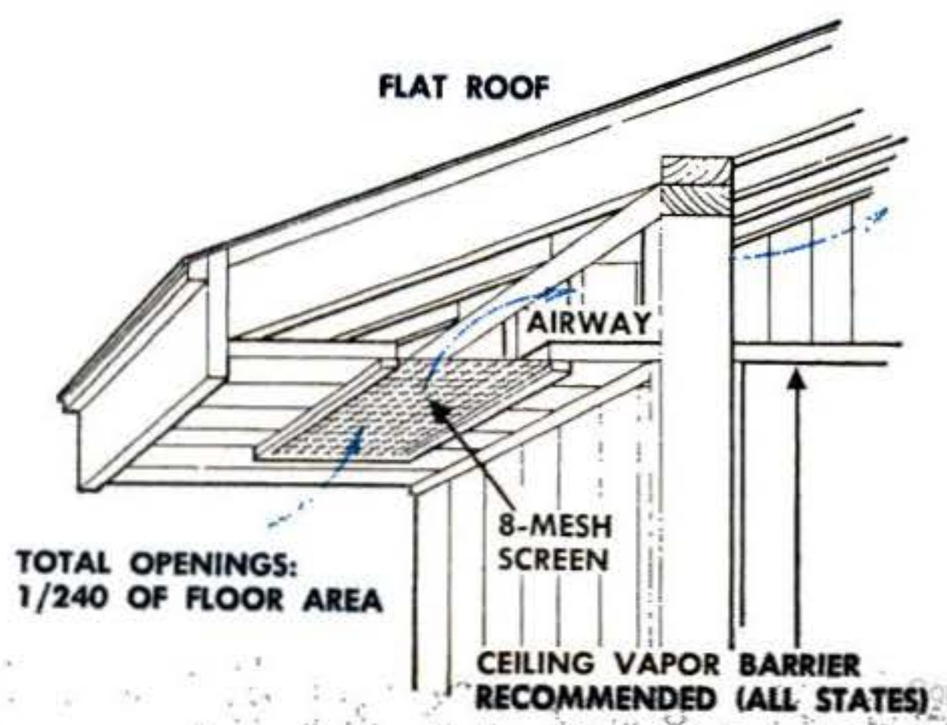
Symptoms. If your windows steam up heavily and frequently during the heating season, the air in the house is too moist. If

VENTS LET MOIST AIR ESCAPE

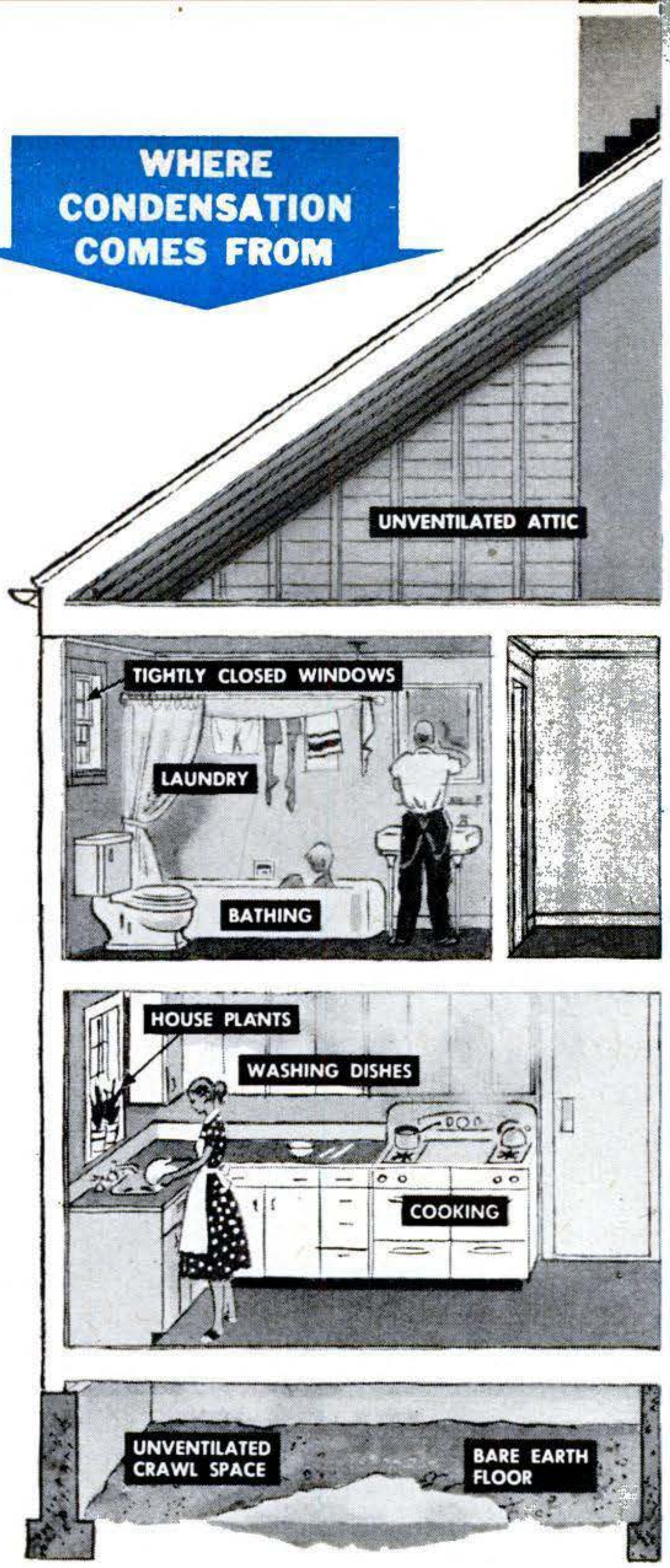
GABLE VENTS are used alone with pitched roofs enclosing unused attic space. Inexpensive ready-made units of wood or metal are widely available in many shapes and sizes.



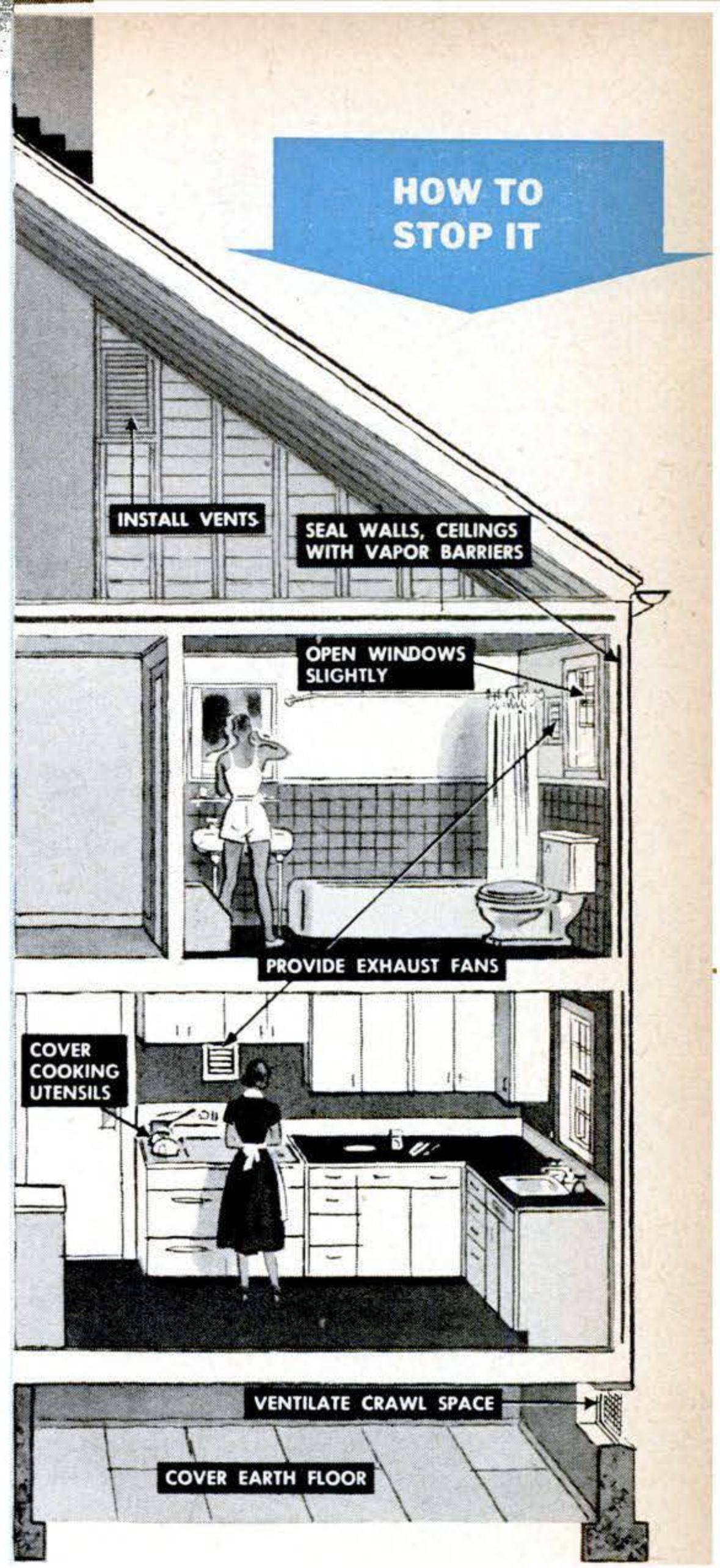
VENTS UNDER EAVES are used alone with flat roofs (pitch less than 3″ per foot). A narrow vent full length of eaves is considered more effective than separate wide vents.



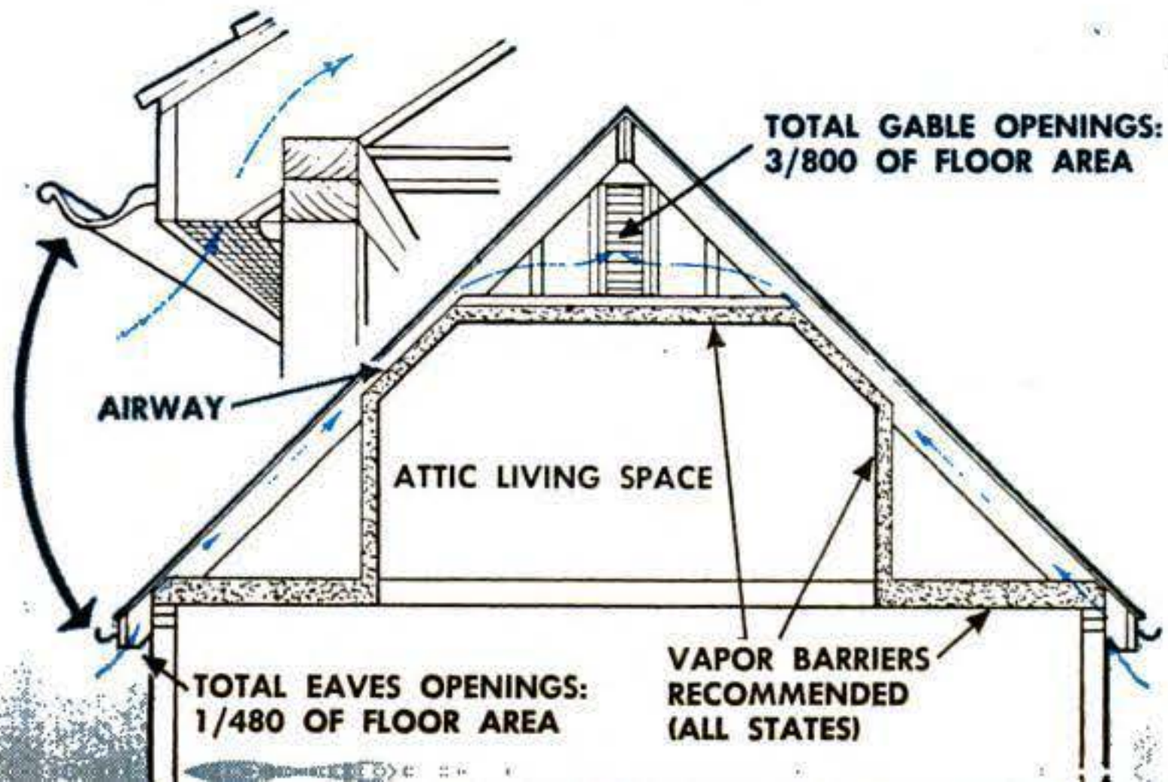
WHERE CONDENSATION COMES FROM



HOW TO STOP IT

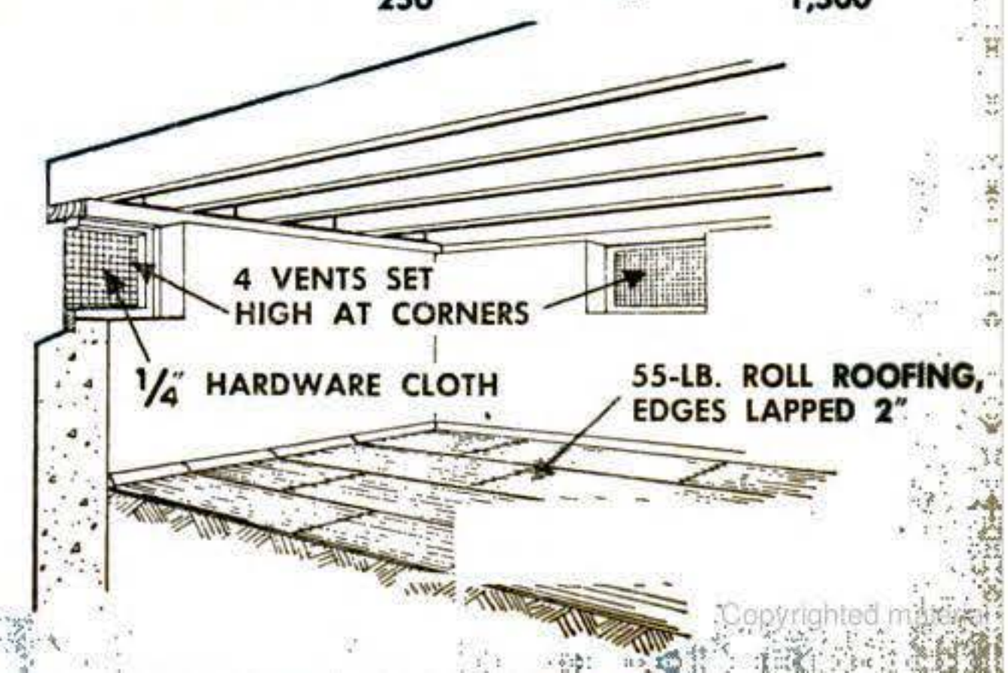


BOTH GABLE AND EAVES VENTS are needed with occupied attics or hip roofs. Their size is based on area of the first floor, not area of the finished rooms in the attic.



CORNER FOUNDATION VENTS protect crawl spaces. Vents can be louvered openings, or masonry blocks built in sideways to expose hollow cores. Earth floor should be covered.

TOTAL OPENING AREA: $\frac{\text{CRAWL-SPACE PERIMETER}}{250} + \frac{\text{CRAWL-SPACE AREA}}{1{,}500}$



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CONDENSATION

you have storm windows and this happens, things are worse yet. Better look for damage—paint peeling inside or outside, interior finish stained, actual rot or dampness on roof rafters or foundation sills. If you find it —and can rule out leaks as a cause—condensation is at work.

What you can do. Getting the extra-moist air outdoors where it cannot hurt anything is the first step. Such simple things as opening the bathroom window when you shower, or convincing your wife that she should cook with the kitchen window open a crack (and with pots covered) will help a lot.

If open windows let in too much cold air, you might want to install exhaust fans or electric dehumidifiers in troublesome rooms such as kitchen, bath or laundry.

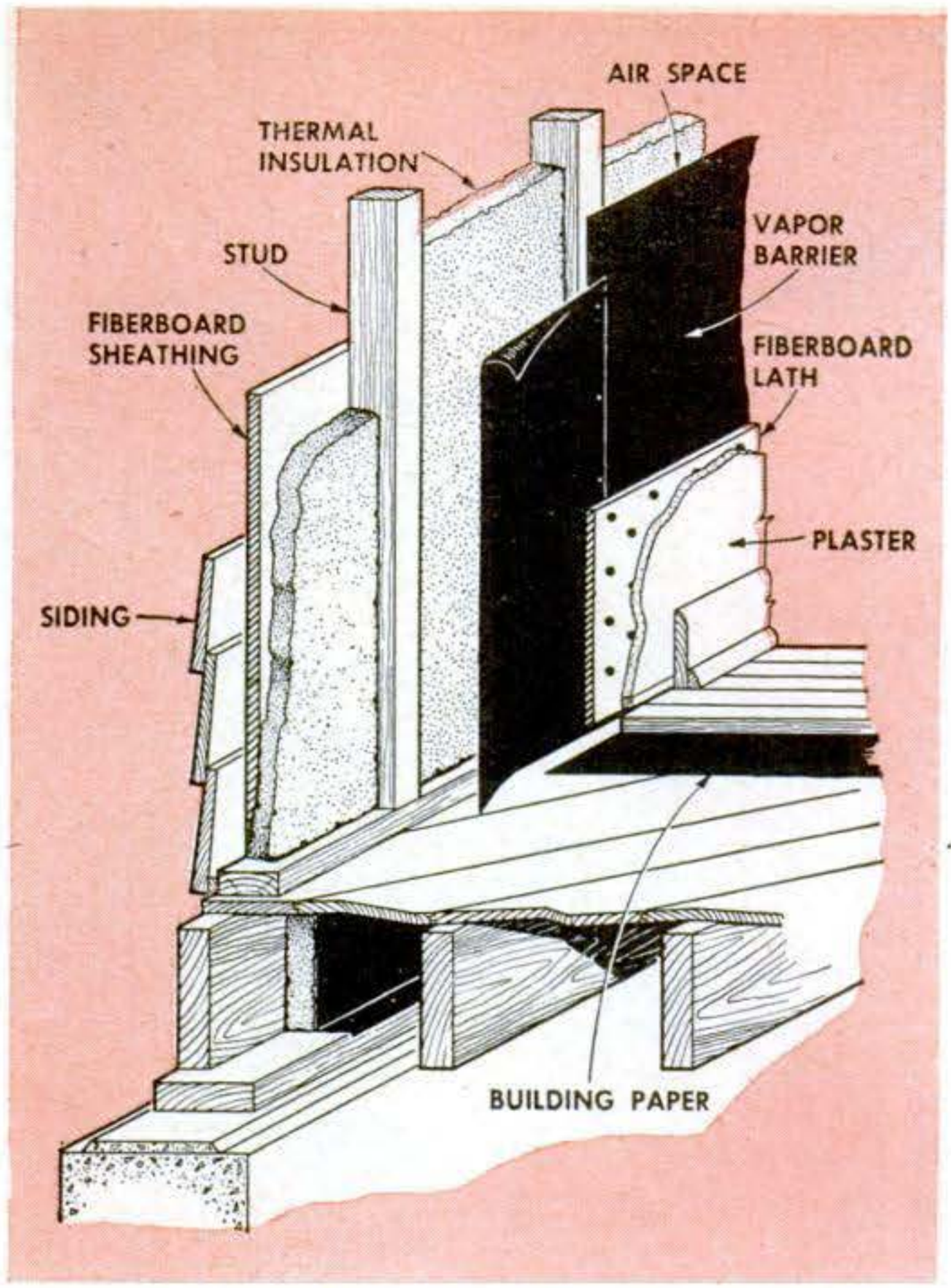
Install permanent vents. These intentional holes in your house keep dry outside air flowing through spaces where condensation is likely. They are a necessity in tightly built modern houses—even in the South. Most new homes have some, but seldom big enough and seldom in all the right places. Adding more, however, is a simple job for the amateur carpenter. Don't make the mistake of closing off vents to save fuel in winter. Cold weather is condensation weather and that is when you need the vents most.

If your house has a gable roof enclosing an unoccupied, unheated attic (insulation in attic floor, not in the roof), louvered, screened vents near the ridge at opposite gable ends will do the job. For any other roof-attic arrangement, additional vents are needed in the eaves.

All vents must be interconnected with unobstructed airways to permit a free flow of outside air. In the unoccupied-gable-roof case, this is simply the attic itself. In other arrangements the airway is the space between rafters, and any insulation installed there must be placed carefully to avoid blocking the airway.

Houses built over crawl spaces also need vents at the foundation corners. These vents must be sizable if the crawl-space floor is bare dirt, but can be reduced 90 percent by covering the earth with water-vapor-proof material—concrete or roll roofing.

The walls themselves are also being vented in many houses. You can buy small units that plug into holes drilled through siding and sheathing. Although no official specifications for wall vents have yet been made, the Government's Housing and Home Finance Agency suggests 1″ of opening per running foot of wall at both top and bottom.



VAPOR BARRIERS seal walls against moist inside air. They must be carefully installed—rips or openings around electrical outlets and windows reduce effectiveness. They are often needed even if insulation is not used.

Provide vapor barriers. These stop moist air from getting into wall and roof spaces. They are usually sheets of asphalt-impregnated paper or metal foil and should be installed on the warm side of insulation when the house is being built. Many brands of blanket and batt insulation have a built-in vapor barrier on one side.

Paint is also a good vapor barrier—and about the only kind that can be provided after a house is finished. For a paint vapor barrier, the Government's Forest Products Laboratory recommends one coat of aluminum primer followed by two decorative coats of flat paint. END

Tape Guards Razor Edge

MASKING tape folded over the unused edge of a double-edge razor blade will let you cut clippings or model parts—and not your fingers.—*S. Rouse, Knightstown, Ind.*

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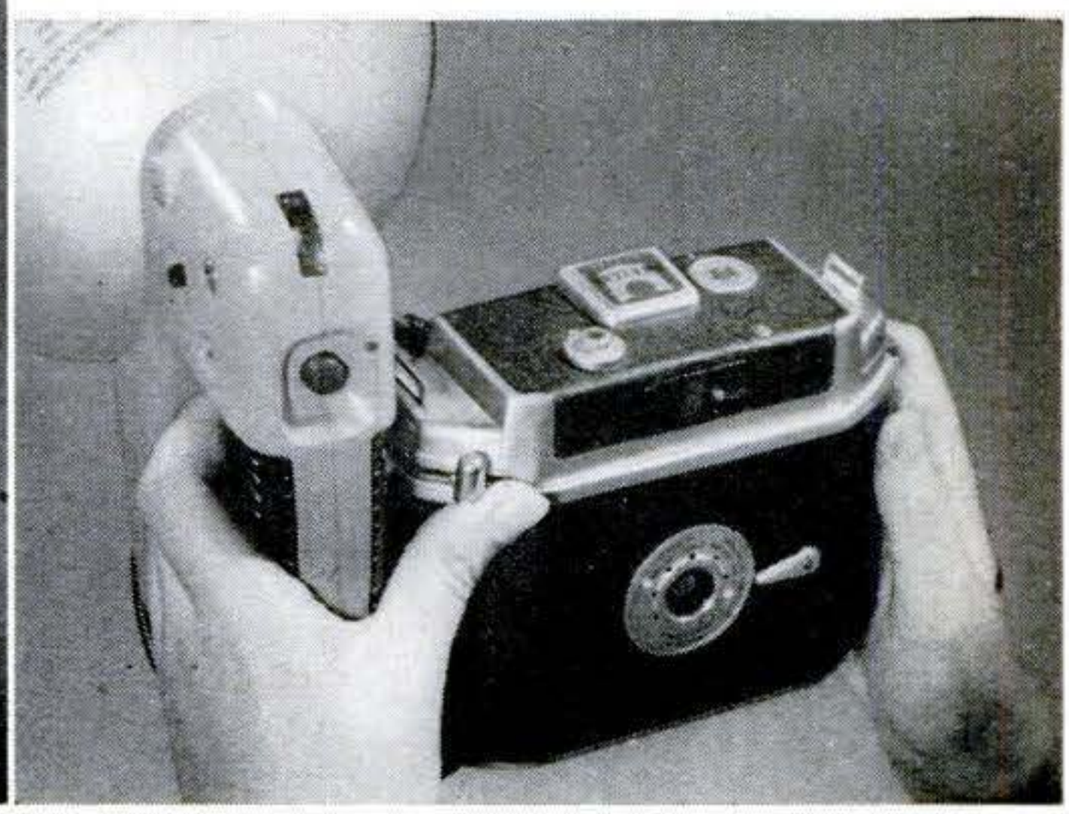
New Work Horse for Cameramen

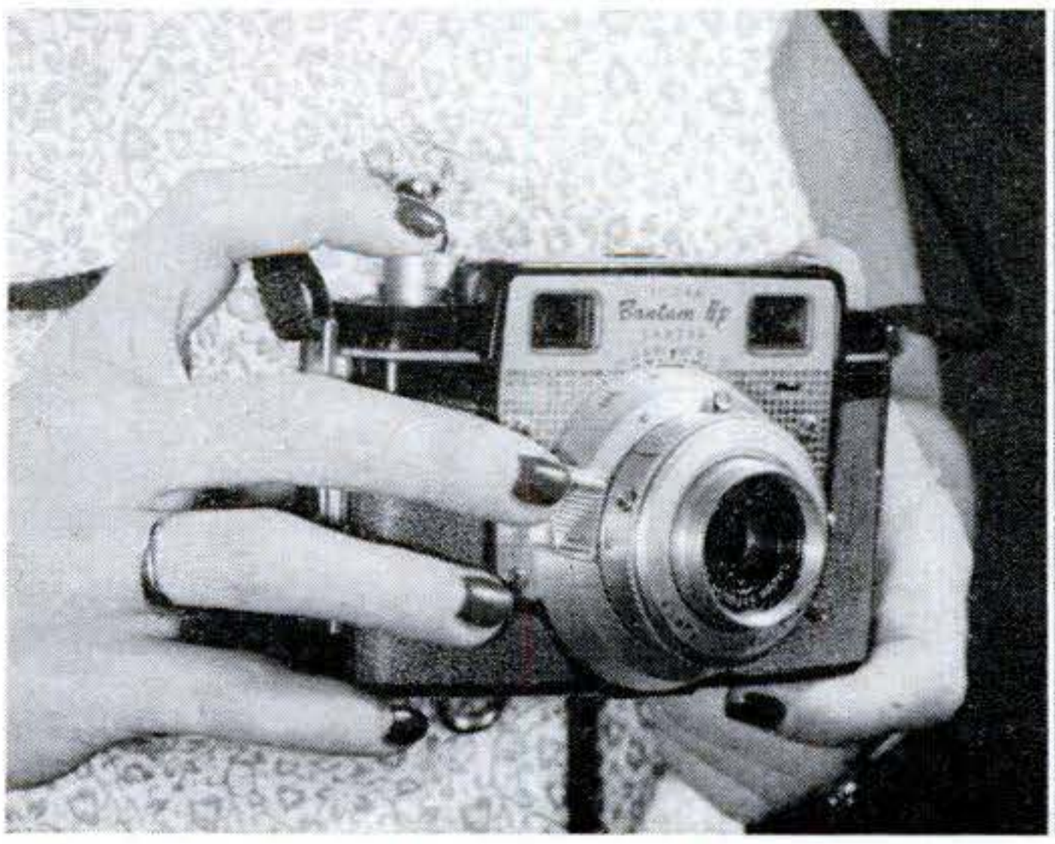
YOU DON'T HAVE TO HUNT for the Chevron's shutter release—it's the long, pivoted bar under the girl's forefinger.



LEVER FILM ADVANCE is easy to use even with flash attached. The Chevron makes 12 pictures 2¼″-square on a roll of 620 film.

THE picture-making versatility of big cameras is packed into a new hand-held roll-film job. Its Ektar f/3.5 lens and one-to 1/800-second shutter with built-in synchronization for class F, class M or strobe flash lamps take care of all lighting conditions. The coupled range finder is accurate to 1½″ at 4′. Among the luxury touches in the new Kodak Chevron is the view finder: it always shows the exact area covered by the lens, it adjusts for people who wear glasses, it has a built-in mask for use with an accessory back that takes small-size color film. The price: $215—without flash.

For less well-heeled photographers, Eastman is also introducing two other new cameras (below). The Brownie Holiday is the first camera selling for less than $5 that the company recommends for color shots. New manufacturing techniques that achieve high precision at low cost did the trick. The Bantam RF is a new lightweight miniature with coated f/3.9 lens, a coupled range finder similar to the Chevron's and a 1/25- to 1/300-second synchronized shutter. Price, with flash and case, less than $80.



FINGER GRIP for focusing and big shutter release on top make the Bantam RF a simple miniature to operate.

THERE'S NOTHING TO ADJUST on the small, rugged Brownie Holiday—just push button on top. Focus, light opening are fixed.

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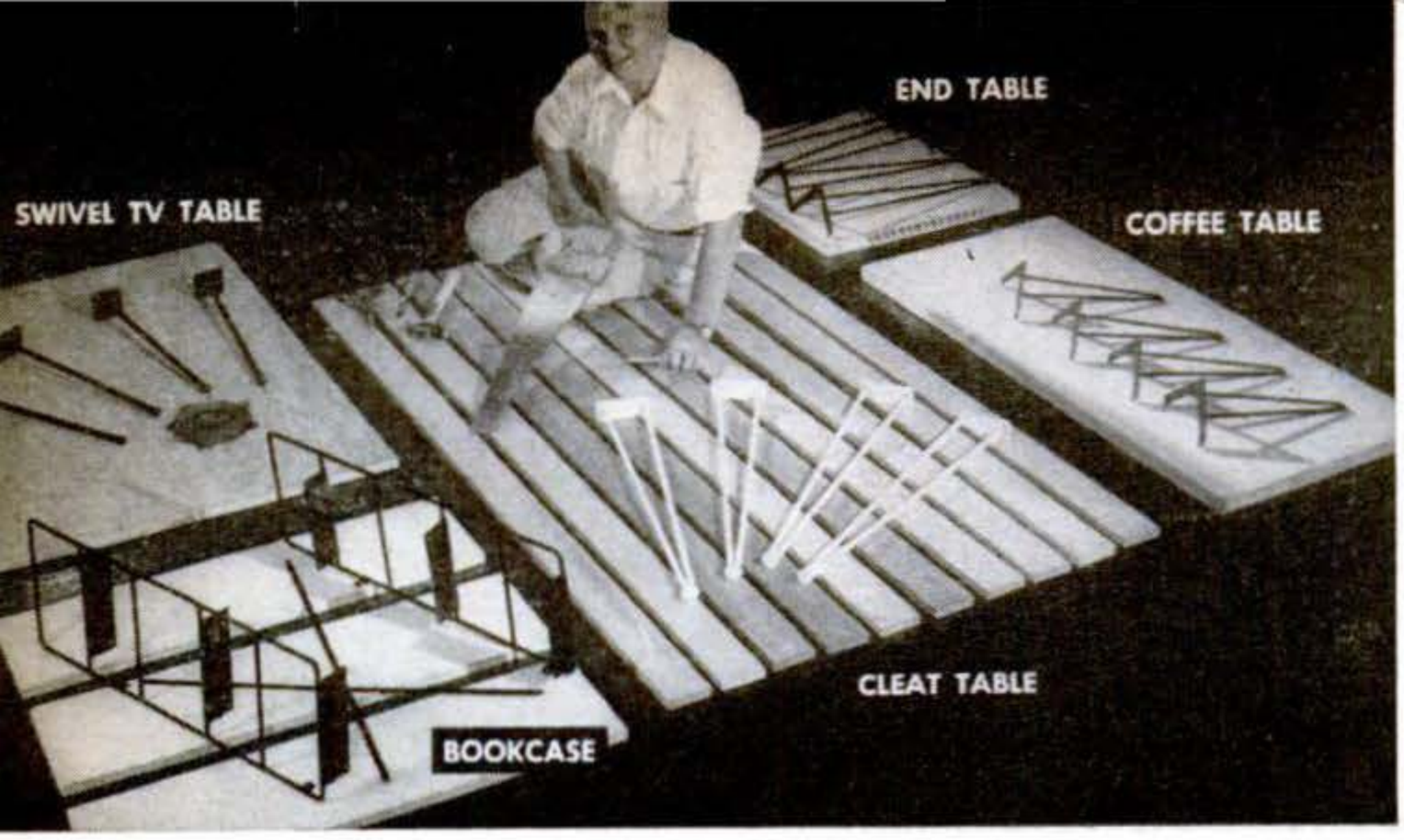


A beginner's story with a happy ending —for both the novice and his wife.

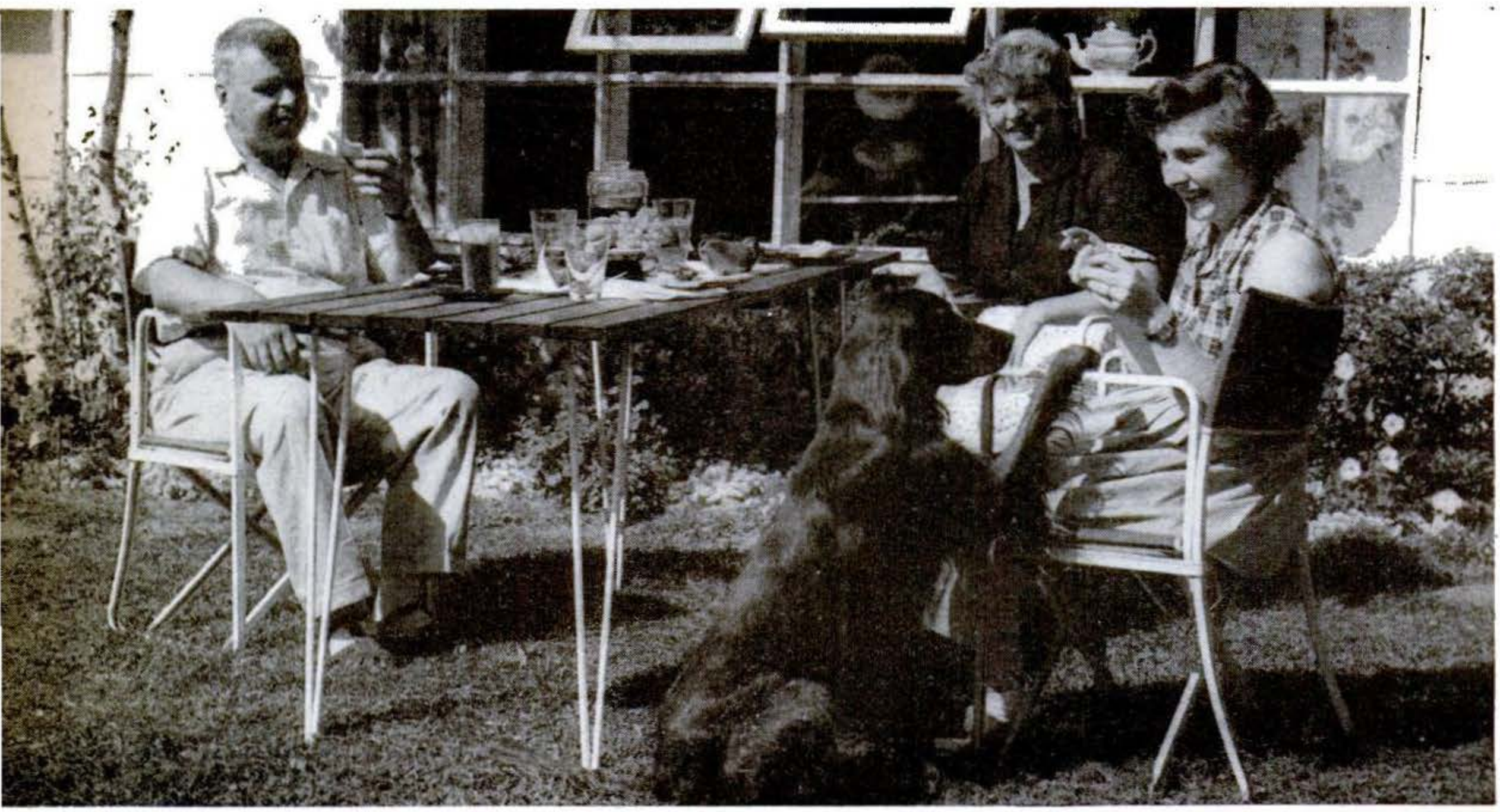
By Henry O. James

"DARLING."

I looked up from my newspaper. The tone of my wife's voice told me that I was in for something.

"The Marvins," she continued, "have just bought some of that new wrought-iron-leg furniture that's all the rage. I was over to see it this afternoon. It's lovely."

"That's nice." I tried to change the subject. "Did you see the piece in the paper



Corky the setter is much more interested in a quick snack than in the cleat table I made.

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Hollow-door coffee table is admired by Mrs. J (left). At right of sofa is my end table.

SWIVEL TV TABLE was a great success. I was getting muscle-bound moving furniture; now I aim my set with a twist of the wrist.

BOOKCASE was the easiest piece to make. I extended pine boards beyond wrought-iron brackets at each end to make whatnot shelves.

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HOLLOW DOOR PRESENTS PROBLEMS

MY FIRST JOB was to square the open end of big piece used for coffee table. Boards to guide the saw are held together by screws through overhang at each side of the door.

CHISELING OUT HONEYCOMB to a depth of about 3″ was a ticklish task. Here the saw guide serves as a protective clamp so that I wouldn't break through the thin mahogany veneer. Using a solid-core door would have been easier but more expensive.

on winter mulching?" I am an amateur gardener.

She ignored my gambit. "We could do with some new furniture."

"Guess we could," I conceded, "but not that wrought-iron stuff. It's modern and we haven't a modern piece in the house."

"But you don't need a modern setting," she countered. "It will fit in with any kind of furniture. Decorators say so."

"Okay. That may be so, but I'll bet it's expensive."

"Umm, yes," admitted my wife, "—if you buy it."

That startled me. "How else are you going to get it?"

"You could build it."

"Me, build it?" I was incredulous.

"You have a screwdriver," said my wife.

"And a can opener," I added.

She handed me a booklet. "I sent for it to a place out in California that sells these wrought-iron legs by mail," she explained. "It's got a lot of suggestions in it, but we could design our own. I have some ideas. Let me show you . . ."

That's how it started. My wife sketched out some rough designs of what she wanted —a coffee table, an end table, a bookcase, a TV table and a cleat table for outdoor eating; we decided on the types and heights of wrought-iron legs we wanted and ordered them by mail.*

While waiting for the legs to arrive, I went about the purchase of lumber, like a babe in the woods. We had decided on a flush door for the coffee-table top—either oak or mahogany. At my local lumberyard I

**The white cleat-table legs the author used came from the Cuprametal Corp., Corona, N. Y.; the black legs and bookcase brackets from E. F. Lawrence Iron Works, Los Angeles 23; and the TV-table swivel from Simon's, 421 Third Ave., NYC.*

BUILDING THE BOOKCASE IS A SIMPLE ASSEMBLING JOB

THREE-FOOT PINE BOARDS made the shelves. To support the boards while I drove screws with the unit upside down, I rigged up crosspiece jigs from lumber scraps. I could have located the brackets at the far ends of the boards. In that case the rear bracing strips would have been fastened in an inverted V position instead of being crossed. Screws were furnished with bookcase brackets and also with all the legs I purchased.

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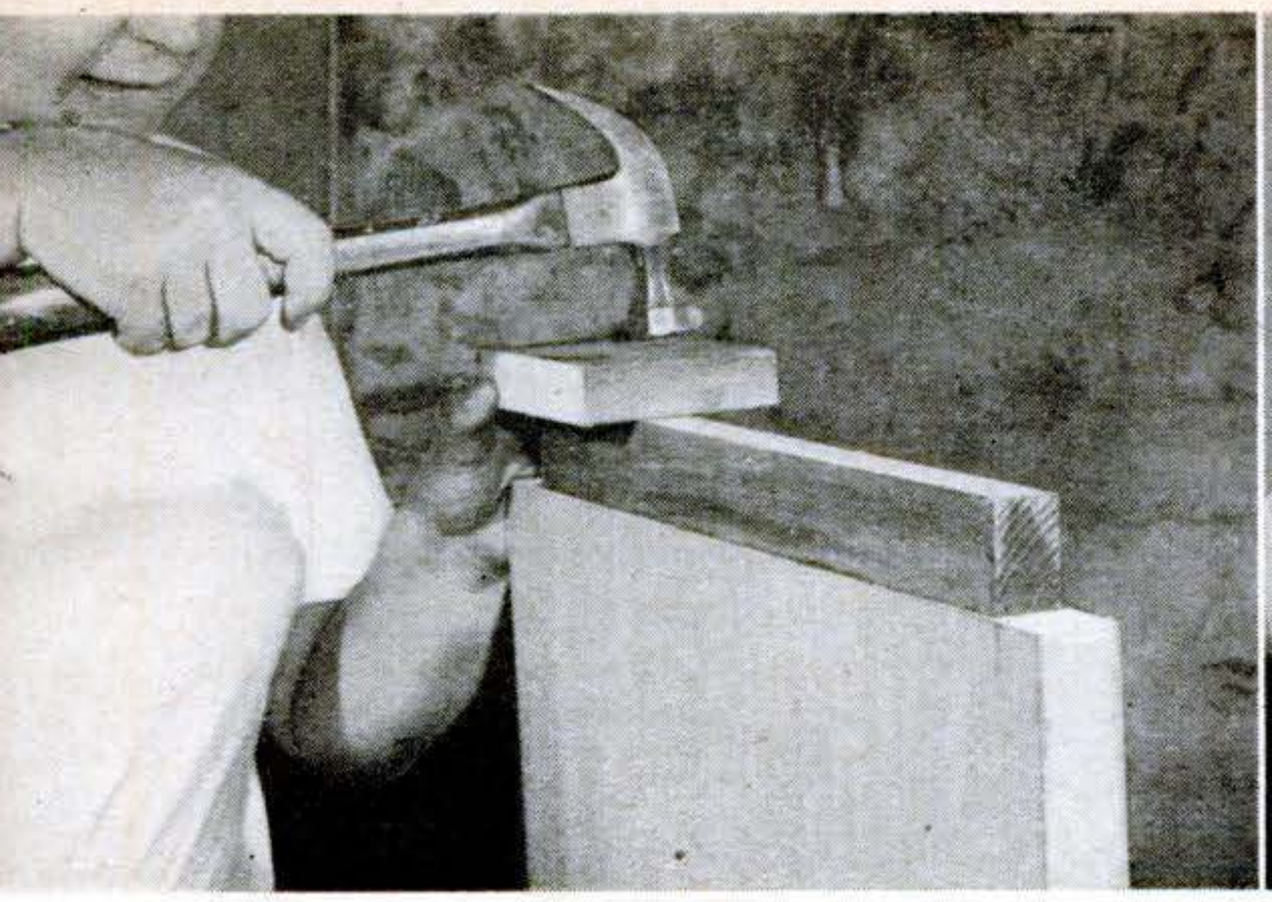
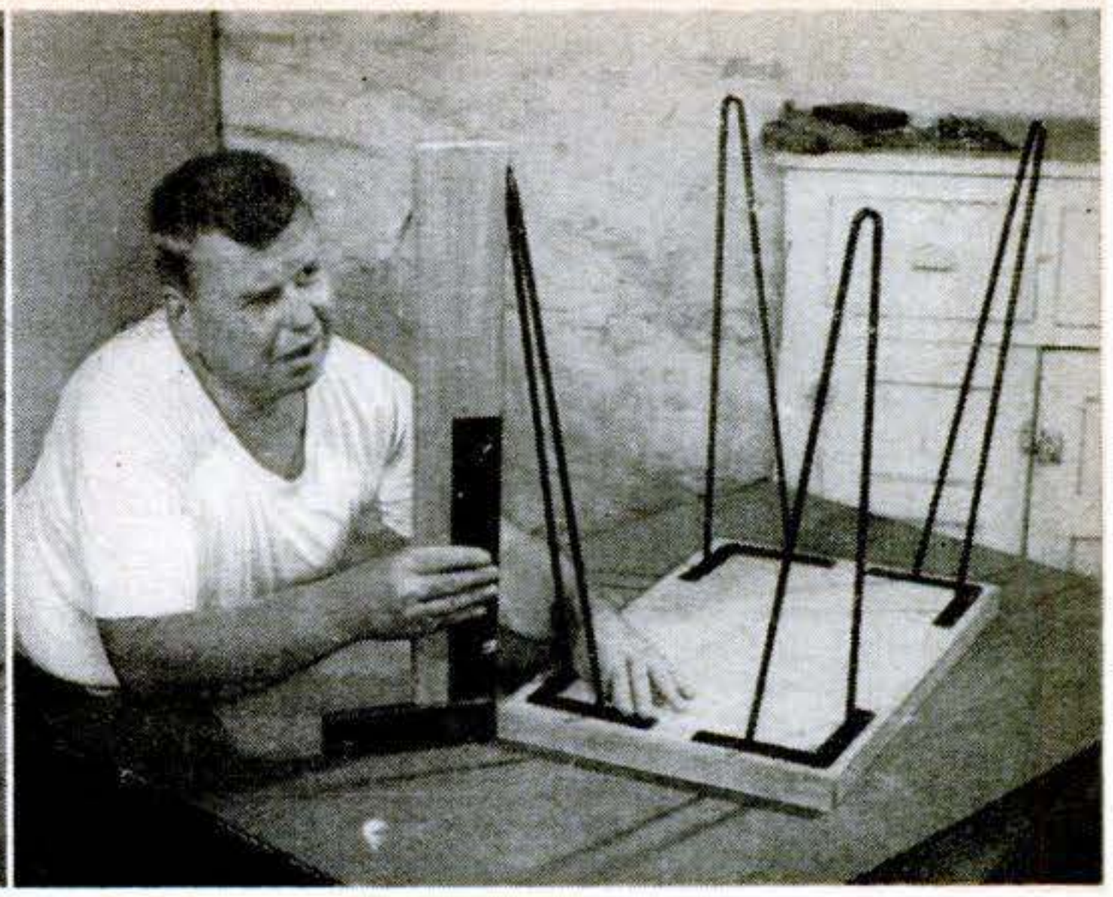


SOLID INSET, to provide grip for screws that attach wrought-iron legs, is hammered into hollowed-out end. Both opening and block were first thoroughly smeared with plastic resin glue. Next my two-board saw guide served as a gluing clamp.



HERE'S ANOTHER TRICK. I wanted the legs of the end table as far out as possible but not sticking beyond the corners where people would trip over them. My small try square was not long enough to reach the tips of the legs, so I used a board as an extension.

found a nice solid-core oak door. I balked, however, at the $35 price. I saw a mahogany door. The man explained that it was hollow, had a honeycomb core. But the price was only $14. I bought it.

I also bought a headache. Since the 24″-wide door was 80″ long, I had the lumberyard cut off one 50″ length for the coffee table, leaving a piece plenty big enough for the end table. I was quite proud of this bit of economy. The headache came later.

For the cleat table, since it was intended for outdoor use, I bought five 12′ pieces of 1″-by-4″ clear cedar. This I had cut into 6′ lengths, giving me 10 pieces, which I figured would be ample for both the top boards and the three underside cleats. Cost: $7.80.

The wrought-iron bookcase brackets I had ordered called for three shelves, so I bought three 1″-by-10″-by-3′ clear pine boards. Cost: $2.34.

By this time some of my wife's enthusiasm was sticking to me. I decided to do something fancy with the TV table—make it swivel. From a wholesale hardware distributor I bought a 7″ swivel gadget that could be sandwiched between two pieces of plywood. Cost of swivel: $2.00.

The upper and lower layers of the sandwich top were to be 24″ squares to allow a small overlap with my TV set. The smallest suitable piece of ¾″ fir plywood in the lumberyard was 3′ by 5′. Cost: $4.50.

What tools? The lumber and the wrought-iron legs arrived at about the same time. I assembled them on the floor in furniture units and took stock of the situation. My wife's quote from the booklet came back to me, "All you need is a screwdriver."

How I was supposed to sand, stain, paint

REDWOOD BOARDS MAKE HANDSOME CLEAT-TABLE TOP

SINCE THE BOARDS WERE ROUGH, I had a big sanding job. Also, the boards were not all exactly the same length; so I had to saw them off even. This I did after the top had been assembled and cleats screwed on. Scraps of ⅜″ plywood serve as separators to keep the seven boards the same distance apart. Depth block on the hand drill kept me from going straight through in making screw holes.

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or varnish wood with a screwdriver, I'll never know. But aside from that, I could undoubtedly screw wrought-iron legs and bookcase brackets into my wood with a screwdriver. But a hammer would help start the screws, so I added that, and a small hand drill to further simplify things in that department. I knew I had to saw the TV table plywood to size, so out came my handsaw. Then I took a squint at the cut through my hollow door. It had been sawed at the lumberyard and didn't look square. Digging around I found an old try square I had forgotten about. And it was while try-squaring an open, honeycombed end of the hollow door that I realized I would also need a chisel to solve the hollow-door headache.

I squared the open end of the 50″ coffee-table top by handsawing it back to 48″. For a saw guide, I rigged up two pieces of board, top and bottom, held clamp-tight by a couple of long woodscrews. In the same way I sawed the 30″ odd end of the flush door in half for a 15″-wide end table.

What to do about the honeycomb? The open honeycomb end remained, however. There were solid pieces of wood set in about 3″ deep at the top and bottom of the door and at each side. But that left my leg brackets, at the open cuts, extending inward about 3″, with screw holes where there was nothing for the screws to grab into in the hollow part.

To solve that I chiseled out the honeycomb strips to a depth of about 3″. Then, I sawed, from a piece of scrap wood, an insert the exact width and inside diameter of the hollowed-out part. I covered the inset with glue and hammered it in, using the sawing guide as a gluing clamp.

Would I do it again? While doing all this I fervently wished that I had bought a solid-core door for the extra $20. But when I saw the finished products, I wasn't so sure. I was quite proud of the job I had done—and it made for a much lighter piece of furniture.

From there on my problems were fairly simple. Before screwing on the wrought-iron legs and bookcase brackets I sanded the wood thoroughly to clean the edges and prepare it for finishing. And that brings in another item of expense—sandpaper, wood putty, glue, filler, varnish, paint and paintbrushes. Cost: about $10.

When I brought my masterpieces up from the basement we had to do a bit of rearranging. But they all blended in very nicely with our assortment of conventional and period furniture. They gave our house

You Can Make Legs for Wrought-Iron Furniture

HERE are two ways you can make metal legs for homemade furniture. The coffee table is just a 1″-by-14″ plank supported on four 12″ lengths of ½″ pipe threaded at one end and turned into floor flanges screwed to wood wedges. The wedges give the legs an attractive outward splay.

The end table rests on two bent-rod loops, the rear one continuing up to support the back edge of the shelf. For this you'll need 12′ of 3/16″ mild-steel rod. Measuring from the center of a 6′ length, make all bends in pairs to keep them identical. The two main upper rods go down through the lower shelf and are held by slotted mending plates that lock in grooves filed on both sides of the rod ends. The legs are attached with cable straps, and the 3/32″ rods are simply set into blind holes in the upper and lower shelves.—*Robert Hoppough, Chico, Calif.*

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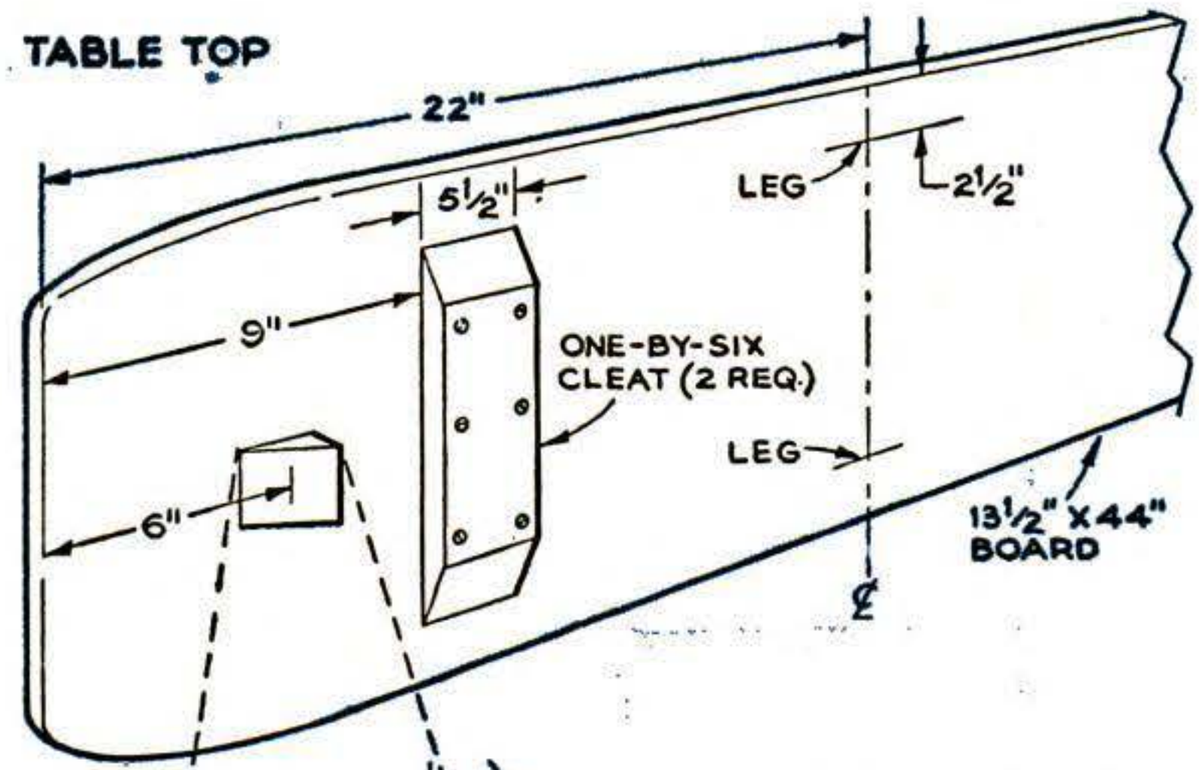
TV TABLE GETS SWIVEL TOP

DIAGONAL PENCIL LINES enabled me to position swivel gadget in exact center of 24"-by-24" plywood sheet. Before screwing it in place, however, I positioned it similarly on bottom sheet to locate four holes for bolts to hold swivel to lower half of the plywood sandwich. I used long bolts so that I could grip them with pliers while tightening nuts. Top was finished with flat black enamel and the edges with Chinese red enamel.

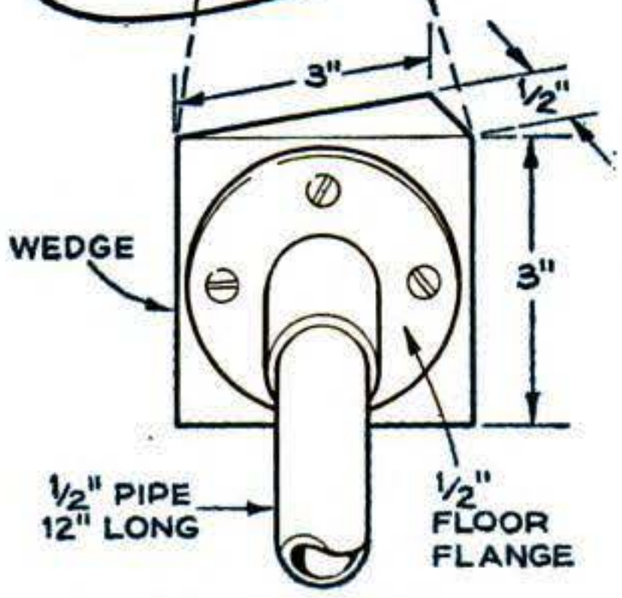
a lift, these five new pieces that had cost me a total of $84.19. Also, it had been fun building them.

My wife surveyed the result with a smug smile. "I knew you could do it," she said. "Now we'll have to invite the Marvins over real soon to see our wrought-iron furniture."

P.S. I am looking through the tool catalogues and planning to set up a real workshop in my basement. And my wife is reading POPULAR SCIENCE lining up projects for me to build. Happy ending? END



WOOD CLEATS on underside of both coffee table (left) and end table (below) add rigidity. Slip rubber crutch tips on the pipe legs to protect the floor. Total cost for both tables: $10.



LEG MOUNTING

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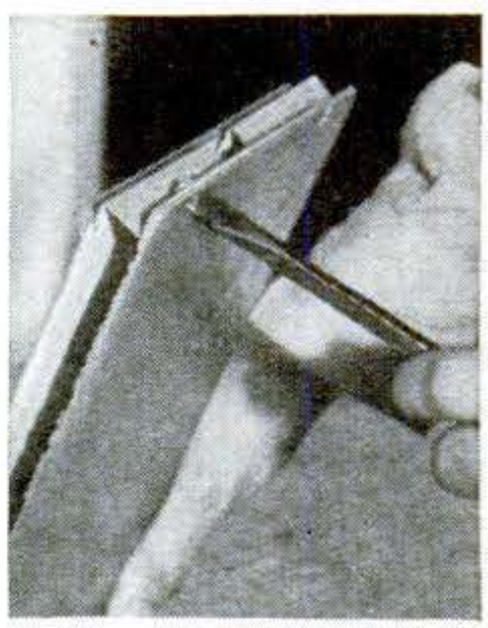
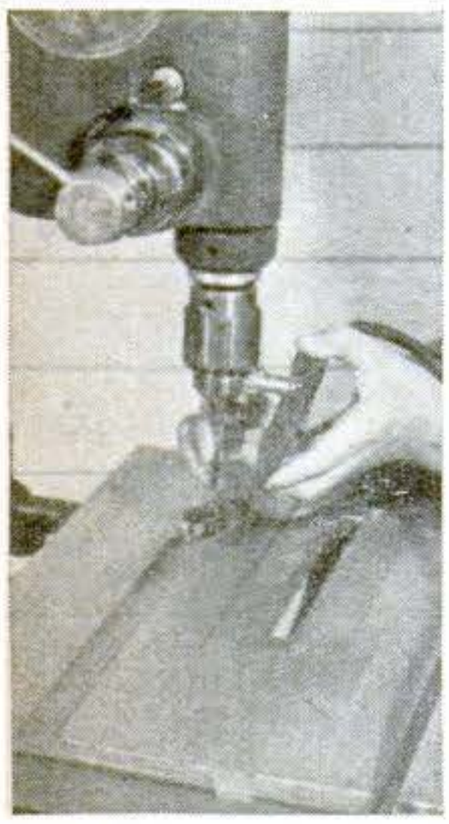
Weighted Easel Can't Slip



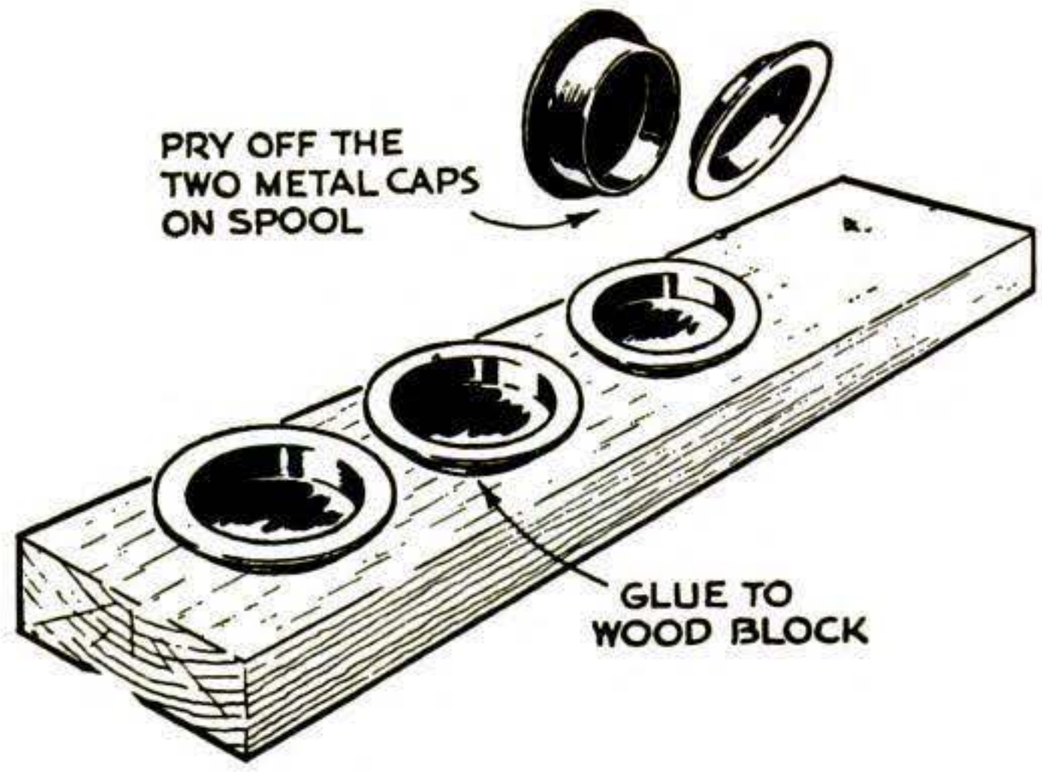
A LEAD plate fastened to the bottom of a photo-enlarging easel will keep it from slipping around on the enlarger base when you insert or remove a sheet of print paper. The weight can be an ordinary type-metal printing plate, available at print shops for little cost, or ⅛" lead sheeting.

Fasten the plate with flathead machine screws, as shown at right above, countersunk to give a flat surface.—*James Deitch, Los Angeles.*

Chuck Key Taped to Power Cord



THERE'S no chance of catching a flying chuck key in the teeth if you tape it to the plug end of the power cord—the key must be removed from the chuck before the machine will run. Attach an extension outlet to the motor mount to make it easier to reach the plug-and-key.—*Bob Gilmore, Sonoma, Calif.*



Palette Made from Tape Spools

SHALLOW metal caps salvaged from cellulose-tape spools are just the right size for mixing small amounts of water colors. Cement several of them to a piece of wood. —*George Kapitan, Bronx, N. Y.*

▶▶▶ Vacuum-cleaning your typewriter is an easy way to keep dirt from accumulating in it. Go over it first with the open hose, then the long upholstery nozzle.

What Would You Do?

My power tools were so dusty that I got silicosis every time I used them. I started out, finally, to buy covers for the tools, but on the way out of the basement I noticed one of my wife's old housecoats. Now that's all I use as power-tool covers. The wide skirts fit easily over workshop tools and when they are dirty, I just dump them in the laundry.—*A. R. Tanner, Cold Spring, N. Y.*

Have you pulled off a smart one lately? PSM will pay for acceptable contributions showing ingenious solutions of problems in the home, shop, garage or camp. It doesn't matter if it's wacky—if it works. Use government postcards only. Contributions cannot be acknowledged or returned.

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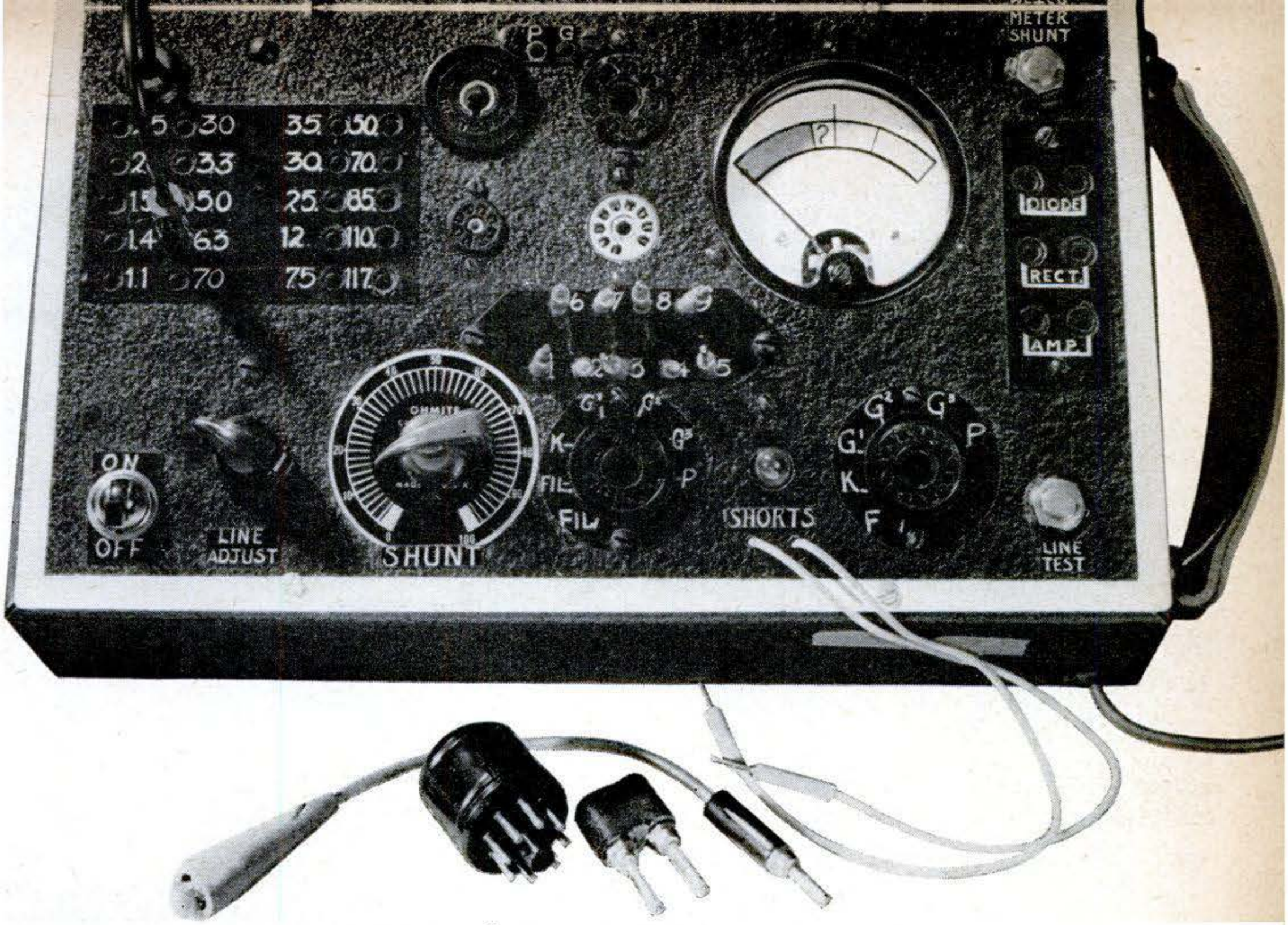

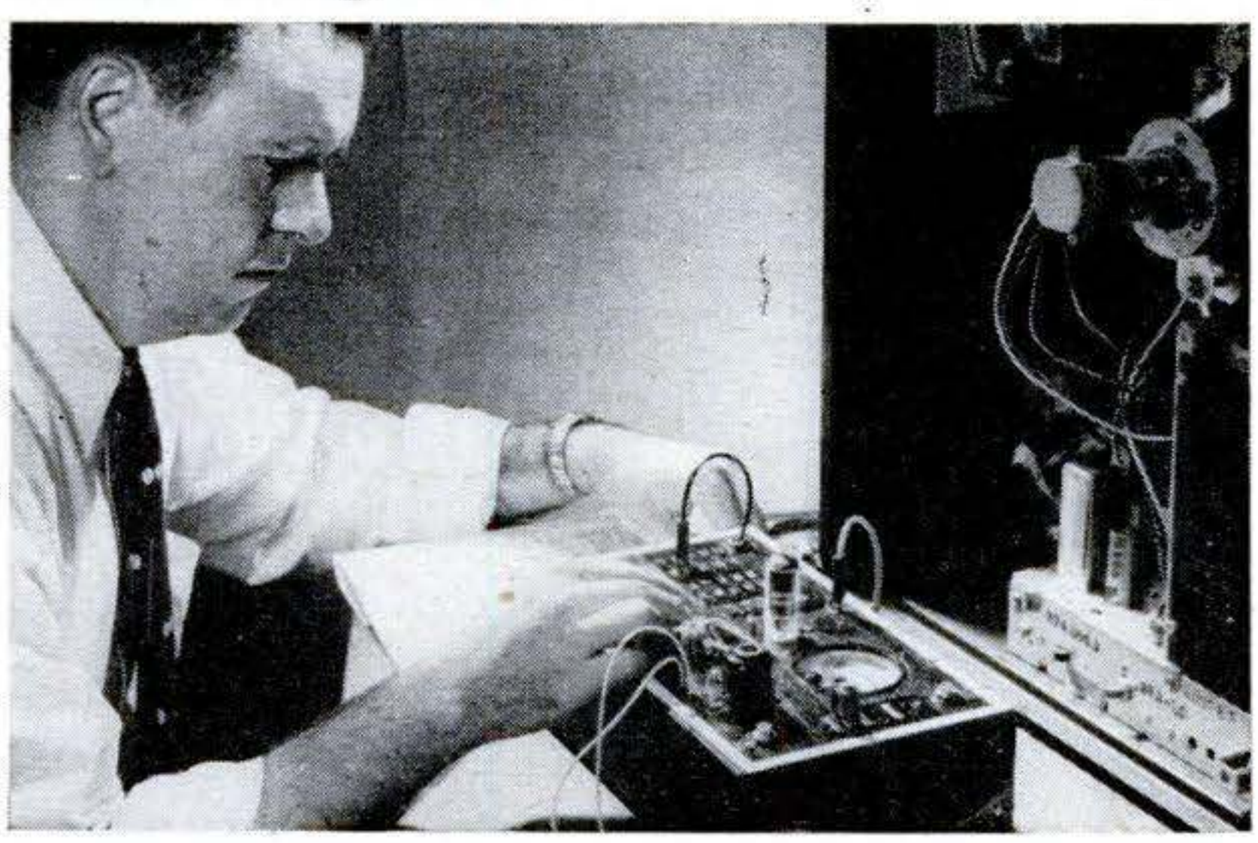

$20 Tester Spots Faulty Tubes

This simple, rugged tube checker works on the same principle as commercial instruments that sell for five times its cost.

By Thomas McGuire

LIKE the best commercial tube testers that sell for $100 up, my homemade job measures a tube's ability to amplify, its transconductance. Yet it costs only about $20.

The saving comes from its simplicity. In store-boughten models fancy switches make test connections at the push of a button. With my checker you plug jacks into a patch board according to the instructions in a standard tube manual.

What you need. The transformer is a special type made for tube checkers. The meter is a zero- to one-milliampere DC milliammeter. Other parts are not critical, but if you get resistors R4, R5, R6 and a shunt-control dial plate like mine, you can use the chart shown later on and save the calibration job.

Since resistors may vary 10 percent from coded values, select R5 and R6 by testing several on an ohmmeter accurate to five percent. R5, nominally 1,500 ohms, should be 1,400 ohms. R6, nominally 22,000 ohms,

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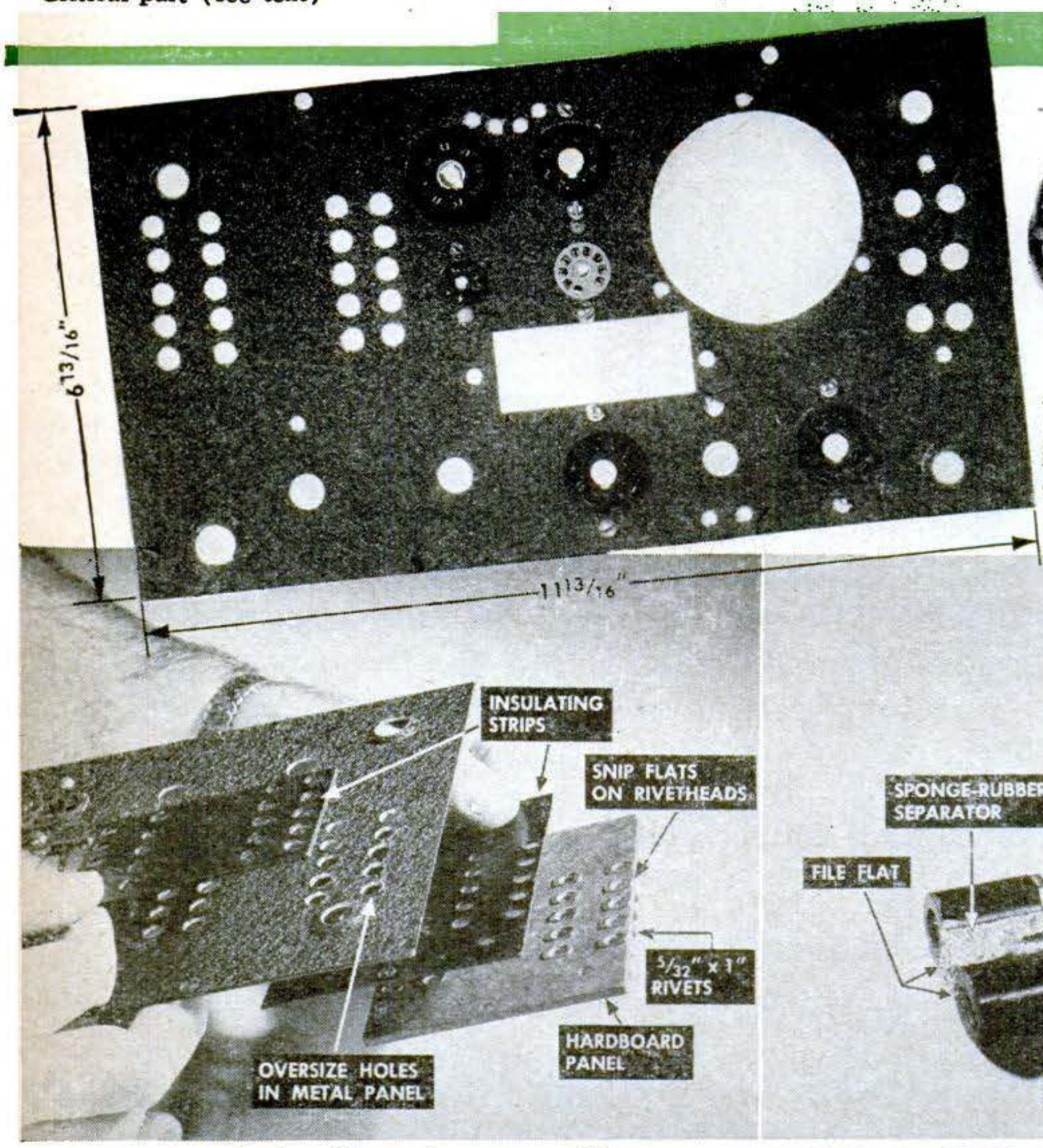
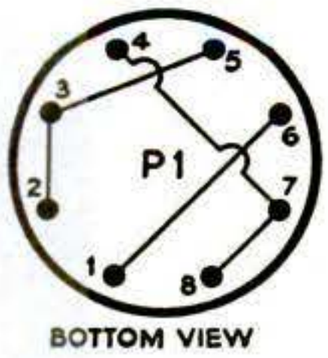
LIST OF PARTS

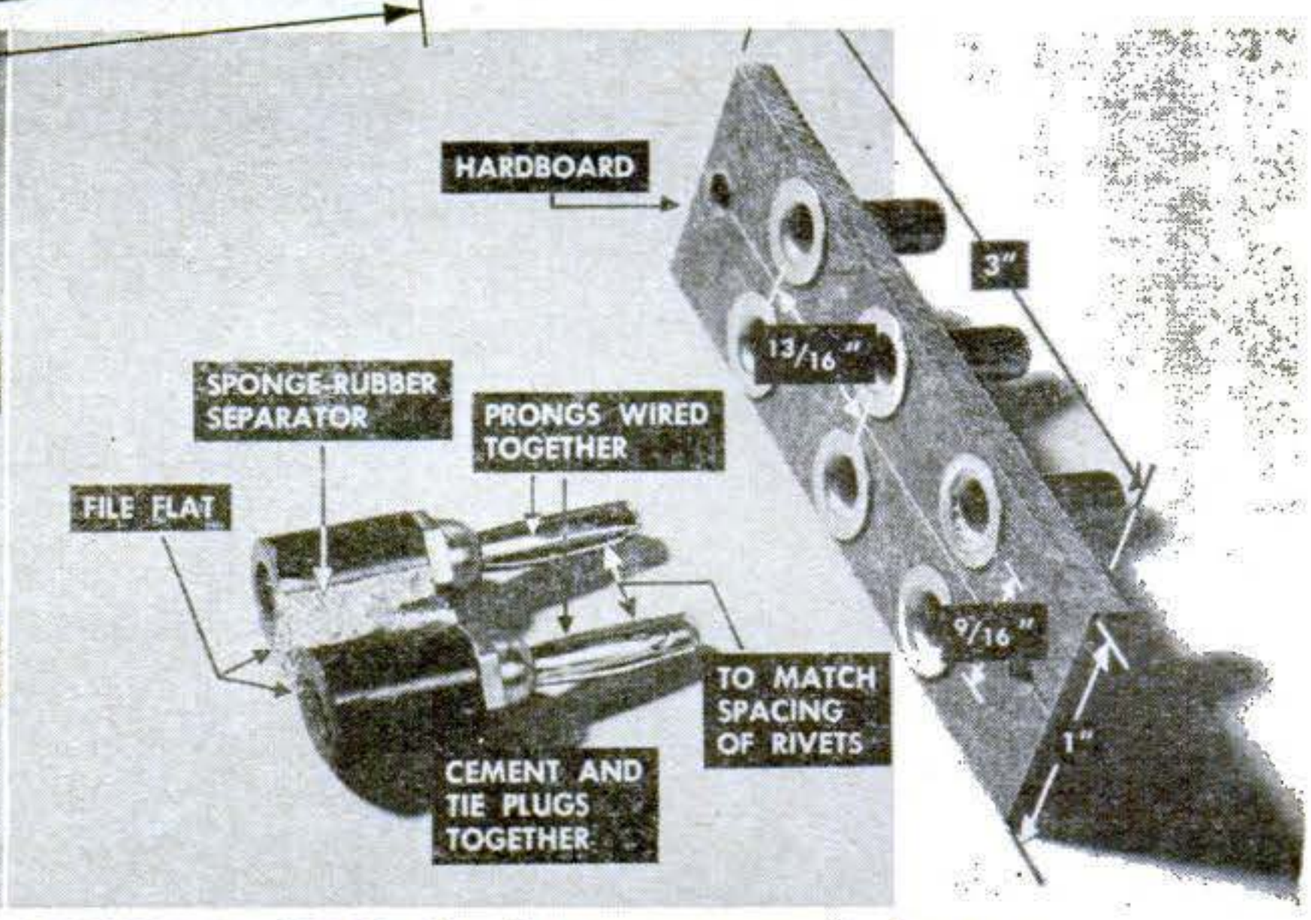
R1: 470,000-ohm, 1-watt carbon
R2, R3: 100,000-ohm, ½-watt carbon
*R4: 500-ohm, 4-watt shunt potentiometer, (linear taper, 279° rotation, Mallory type M-500-P)
*R5: 1,500-ohm, 10-watt wire-wound
*R6: 22,000-ohm, 2-watt carbon
R7: 1,800-ohm, 1-watt carbon
R8: 200-ohm, 25-watt pot.
C1: .1-mfd., 400-volt paper
S1: 115-volt line switch
S2, S3: normally-open push switches
P1: octal plug
J1, J2: octal sockets
Test sockets: one each, octal, loctal, 7-pin, 9-pin miniatures
Banana plugs (4 req.)
Banana jacks or 5/32" x ½" tubular rivets (26 req.)
Phone tips (11 req.)
65-ma. selenium rectifier
NE-51 neon lamp and socket
0-to-1 ma. meter; extra scale plate
Tube-checker transformer (Stancor P-1834-3)
Six-lug terminal strips (2 req.)
Line cord and plug
Phosphor-bronze wire (12')
3" x 7" x 12" metal cabinet with removable cover
*0-to-100 dial plate, 2 3/16" dia., 295° rotation (Ohmite No. 5000 or equiv.)
Alligator clip with insulating hood
*Critical part (see text)





JUMPER PLUG is octal type (or simply tube base) with interconnected pins. Chassis layout is shown at left.

BRASS RIVETS in hardboard serve as filament-voltage jacks, each wired to one of transformer's 20 taps. Screw transformer to this panel.



PATCHING PLUG is interconnected banana plugs fastened together with sponge rubber, cement and twine.

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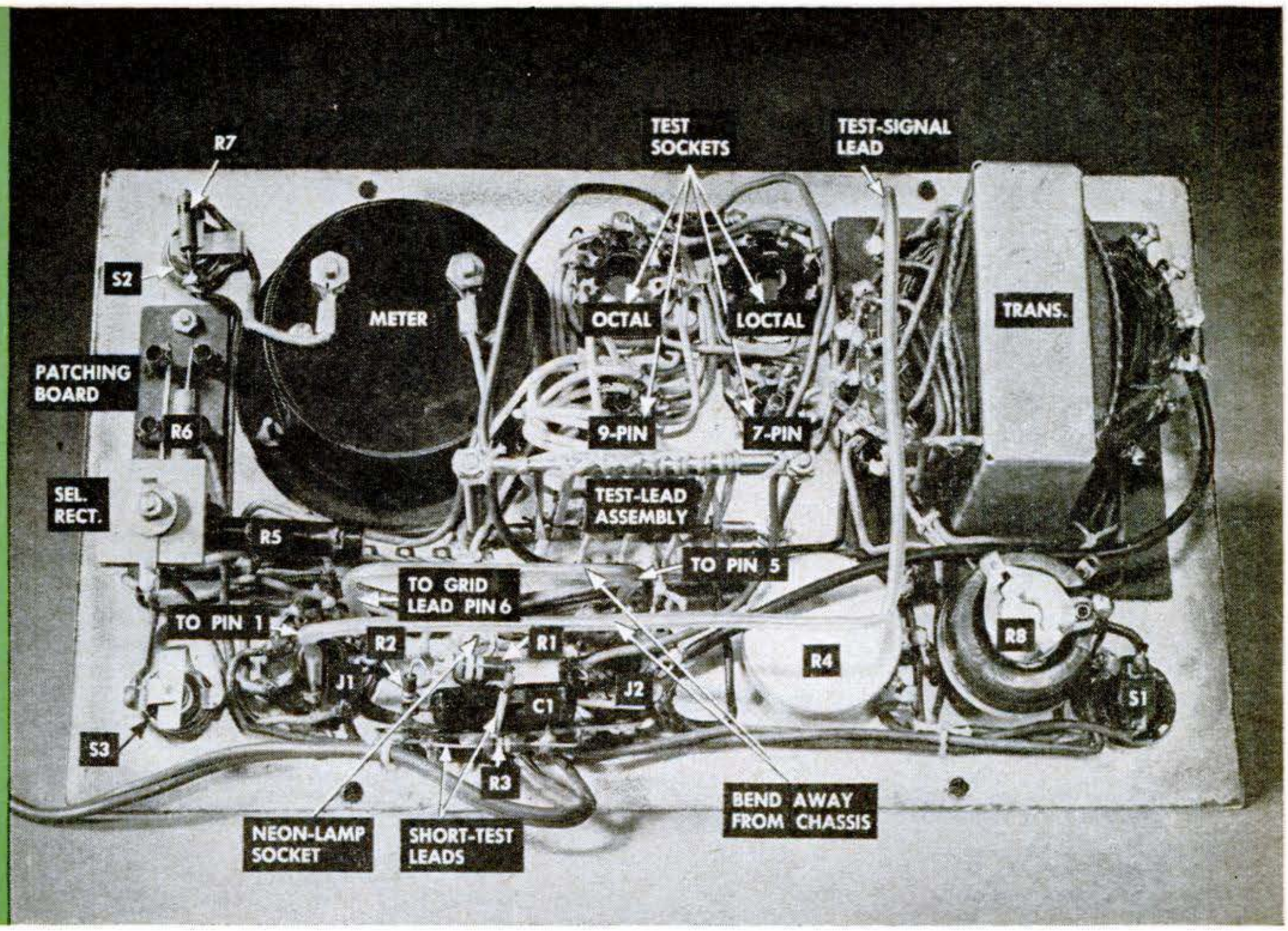


should be 20,500. Buy the shunt control and dial plate listed.

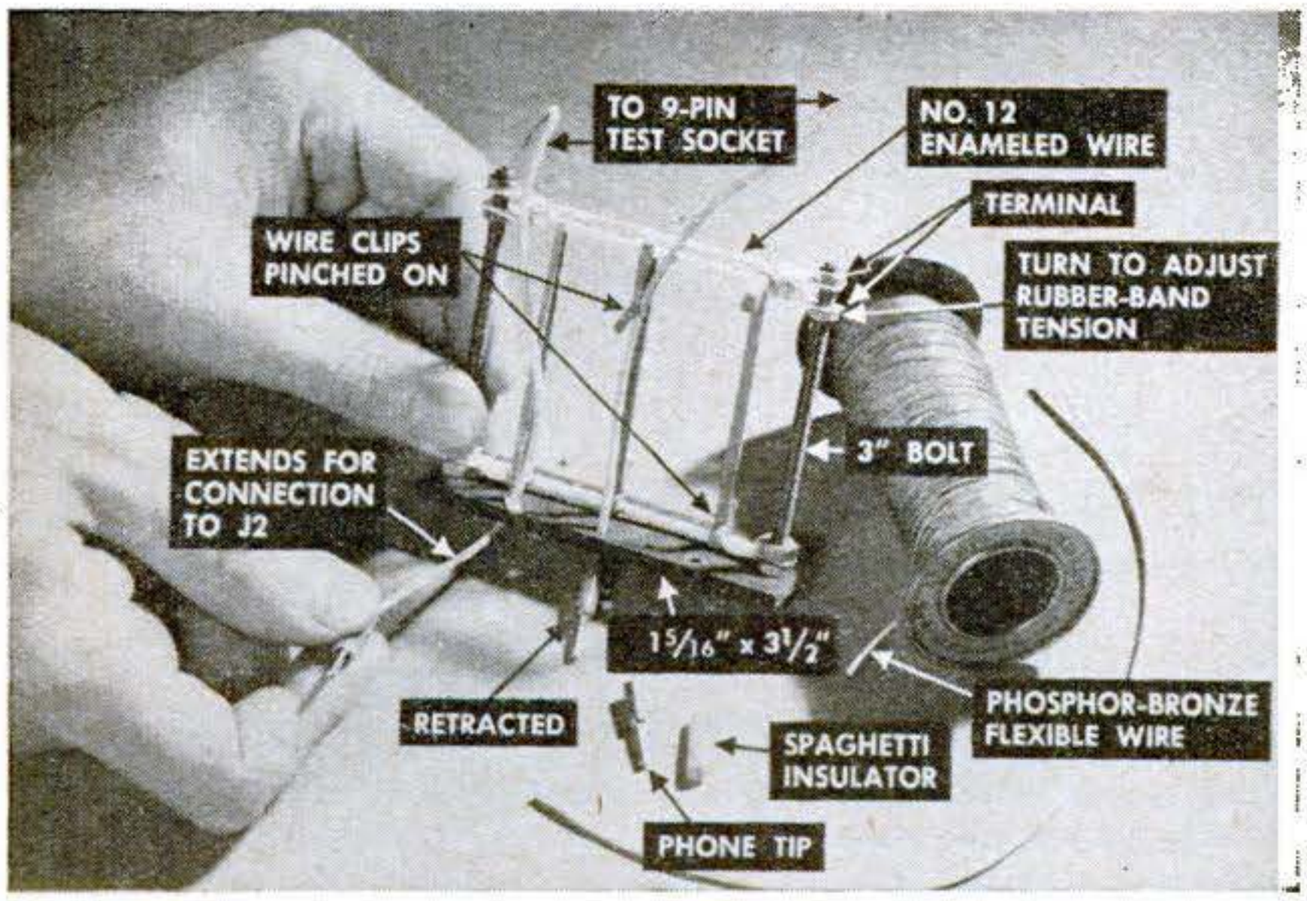
Assembly. Alter the layout as necessary to make the parts fit easily on the metal chassis panel with a ½″ margin around the edge. The meter is fragile—try it for fit, then put it aside.

Wire the four test sockets first, hooking their pins in parallel. When you wire octal socket J1 to the 7.5-volt transformer tap, use heavy bus wire. Cover the lead with insulating spaghetti and bend it to stand 2″ away from the chassis. This lead carries the test-signal voltage; spacing it this way keeps it from picking up false signals. Use a similar bus-bar and spaghetti connection between pin 6 on J1 and pin 5 on J2.

Note that J1 and J2 are connected to two contact jacks at the top of the panel marked P and G. These external plate and grid terminals are provided for tubes that make these connections through top caps instead of socket pins. Insulate the two jacks from the panel and make a short jumper wire with a banana jack and an insulated alligator clip.

Prepare a new meter scale marked at the mid-point, one-tenth of the way to the left and two-tenths of the way to the right.

Calibration. The chart gives you calibration points for most common tubes. If you want to test a tube not listed (or if your checker varies from the specifications given), use a good tube of the same type to establish the calibration. Run it through the regular test procedure up to step 10. Then adjust the shunt knob until the meter reads about 70 percent; the shunt adjustment required to give the 70-percent reading is the calibration number for that tube.



RUBBER BANDS on frame retract test leads—phosphor-bronze flexible wire. Tinning wire at point to be cut prevents it from unraveling.

Please turn the page for more about tube checker.

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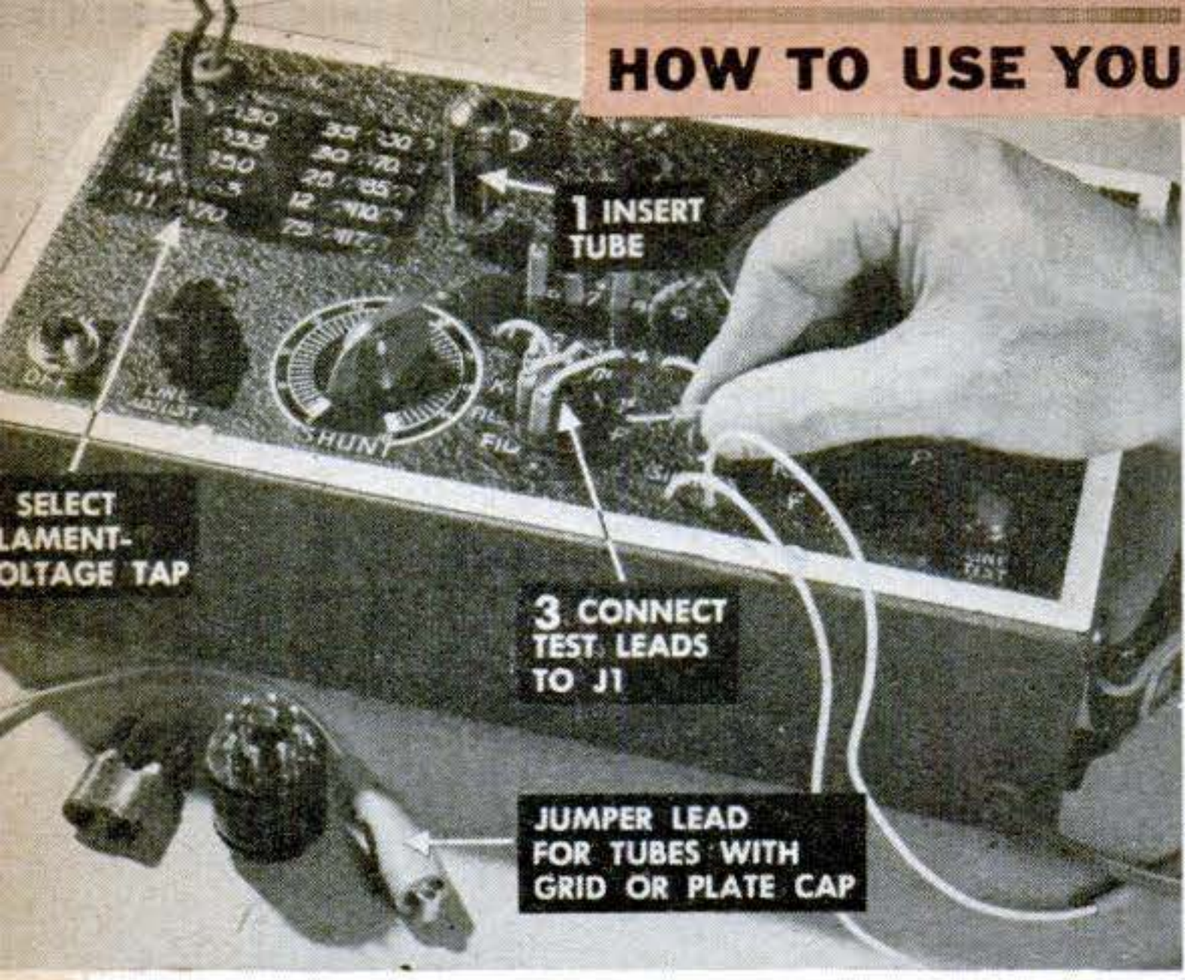
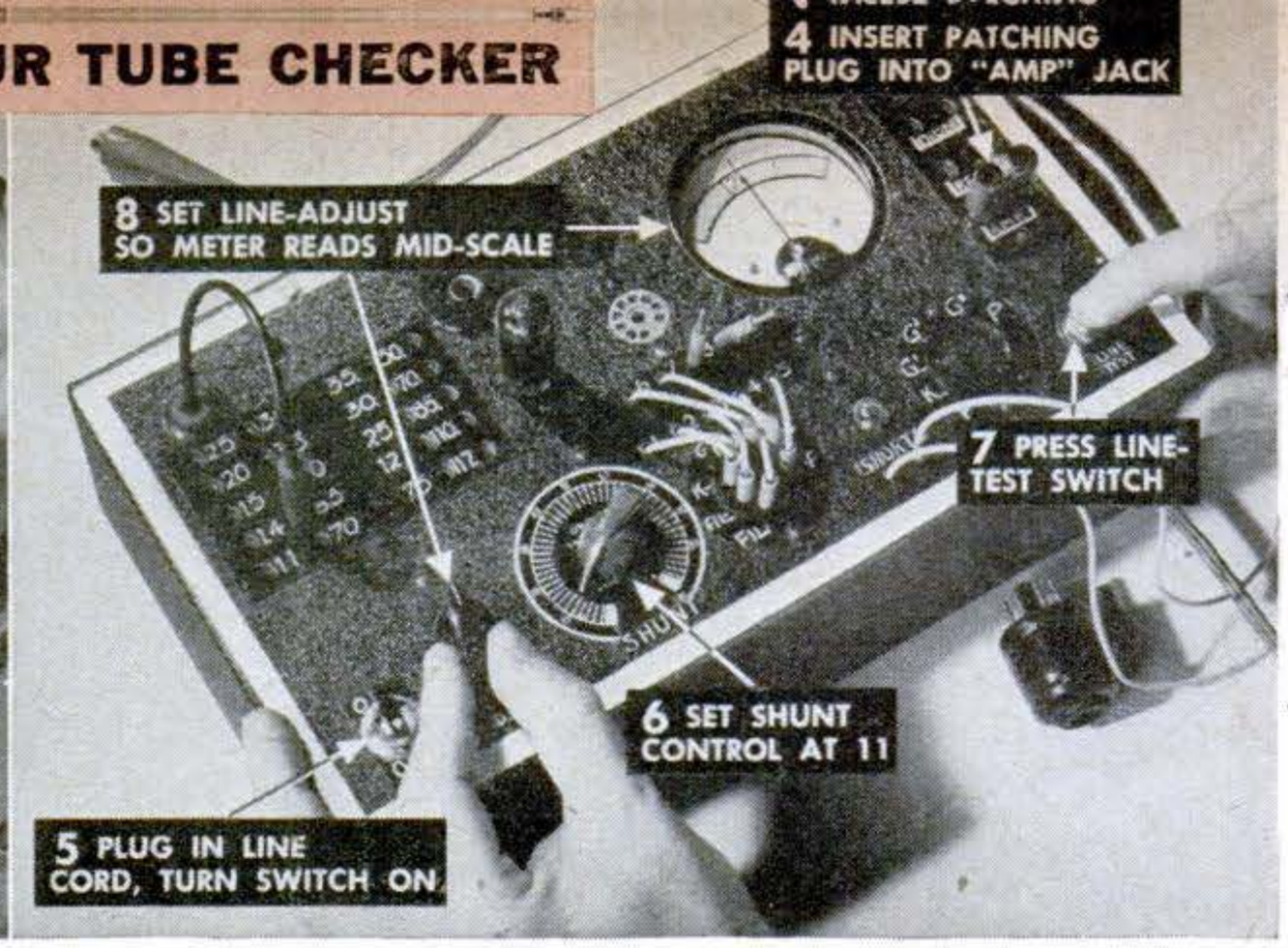
HOW TO USE YOUR TUBE CHECKER





1 SET UP CHECKER. Procedure, shown for 6CB6 pentode, is same for nearly all tubes. Tube manual gives value of filament voltage for step 2, has chart showing which number test lead goes to which part of tube for step 3.

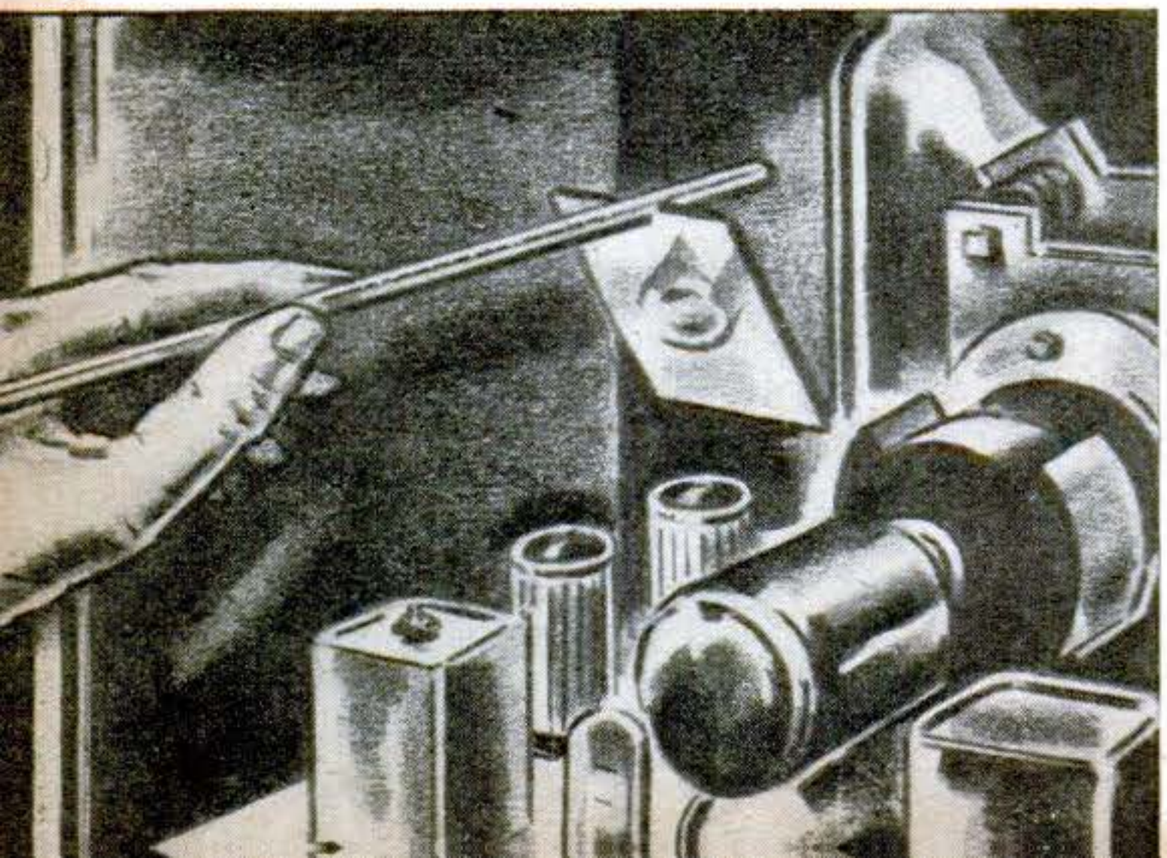
2 ADJUST FOR LINE VOLTAGE. With patching plug in AMP socket (regardless of tube type), turn tester on and set shunt control to 11 (for any tube). Press line-test button, adjust line control to center needle.

CALIBRATION TABLE

TUBE	TYPE OR SECTION	FIL. TAP	PIN CONNECTIONS (TO J2) F	F	K	G1	G2	G3	P	SHUNT SET'G	PATCHING PLUG (Step 11)
1B3-GT	rectifier	1.4	2	7	—	—	—	—	✳	14	DIODE✣
1R5	oscillator	1.4	1	7	—	4			3	40	AMP
	pentode	"	"	"	—	6	3	4	2	46	"
1S4	pentode	1.4	1	7	—	3	4	—	6		AMP
1S5	pentode	1.4	1	7	—	6	4	—	5	42	AMP
	diode	"	"	"	—	—	—	—	3	10	DIODE✣
1U4	pentode	1.4	1	7	—	6	3	—	2	42	AMP
1U5	pentode	1.4	1	7	—	6	3	—	2	42	AMP
	diode	"	"	"	—	—	—	—	4	12	DIODE✣
1X2	rectifier	1.1	2	9	—	—	—	—	✳	22	DIODE✣
3Q4	pentode	2.5	1	7	—	3	4	5	6	28	AMP
3S4	pentode	2.5	1	7	—	3	4	5	6	26	AMP
3V4	pentode	2.5	1	7	—	6	3	5	2	30	AMP
5U4	rectifier	5	2	8	—	—	—	—	6	9	RECT
	"	"	"	"	—	—	—	—	4	9	"
5Y3	rectifier	5	2	8	—	—	—	—	6	8	RECT
	"	"	"	"	—	—	—	—	4	8	"
6AB4	triode	6.3	3	4	7	6	—	—	1	16	AMP
6AC7	pentode	6.3	2	7	5	4	6	3	8	18	AMP
6AG5	pentode	6.3	3	4	7	1	6	—	5	22	AMP
6AG7	pentode	6.3	2	7	5	4	6	1	8	16	AMP
6AH4	triode	6.3	2	7	8	1	—	—	5	14	AMP
6AH6	pentode	6.3	3	4	7	1	6	2	5	18	AMP
6AL5	diode	6.3	3	4	1	—	—	—	7	8	DIODE✣
	"	"	"	"	5	—	—	—	2	8	" ✣
6AQ5	pentode	6.3	3	4	2	7	6	—	5	18	AMP
6AS6	pentode	6.3	3	4	2	1	6	7	5	18	AMP
6AT6	triode	6.3	3	4	2	1	—	—	7	30	AMP
	diode	"	"	"	"	—	—	—	6	8	DIODE✣

TUBE	TYPE OR SECTION	FIL. TAP	PIN CONNECTIONS (TO J2) F	F	K	G1	G2	G3	P	SHUNT SET'G	PATCHING PLUG (Step 11)
6AT6	diode	6.3	3	4	2	—	—	—	5	8	DIODE✣
6AU5	beam power	6.3	2	7	3	1	8	—	5	16	AMP
6AU6	pentode	6.3	3	4	7	1	6	2	5	18	AMP
6AV5	beam power	6.3	2	7	3	1	8	—	5	16	AMP
6AX5	rectifier	6.3	2	7	8	—	—	—	5	8	RECT
	"	"	"	"	"	—	—	—	3	8	"
6BA6	pentode	6.3	3	4	7	1	6	2	5	20	AMP
6BC5	pentode	6.3	3	4	7	1	6	—	5	18	AMP
6BE6	oscillator	6.3	3	4	2	1	—	—	6	16	AMP
	pentode	"	"	"	"	7	6	1	5	32	"
6BF5	pentode	6.3	3	4	2	1	6	—	5	14	AMP
6BG6	beam power	6.3	2	7	3	5	8	—	✳	16	AMP
6BH6	pentode	6.3	3	4	2	1	6	7	5	18	AMP
6BJ6	pentode	6.3	3	4	2	1	6	7	5	18	AMP
6BK5	pentode	6.3	4	5	6	3	8	—	1	18	AMP
6BL7	triode	6.3	7	8	3	1	—	—	2	18	AMP
	"	"	"	"	6	4	—	—	5	18	"
6BN6	limiter	6.3	3	4	1	2	5	6	7	46	AMP
	quadrature	"	"	"	"	6	5	2	7	36	"
6BQ6	beam power	6.3	2	7	8	5	4	—	✳	18	AMP
6BQ7	triode	6.3	4	5	8	7	—	—	6	18	AMP
	"	"	"	"	3	2	—	—	1	18	"
6BY5	rectifier	6.3	2	7	1	—	—	—	4	6	RECT
	"	"	"	"	8	—	—	—	5	6	"
6BZ7	triode	6.3	4	5	8	7	—	—	6	16	AMP
	"	"	"	"	3	2	—	—	1	16	"
6C4	triode	6.3	3	4	7	6	—	—	5	25	AMP
6CB6	pentode	6.3	3	4	2	1	6	7	5	16	AMP
6CD6	beam power	6.3	2	7	3	5	8	—	✳	14	AMP

✣Press meter-shunt switch in test 12 ✳Use external jumper to plate cap



Mirror on End of Stick Checks Filaments of Tubes Inside Set

WHEN you're checking the filaments of TV tubes, a small pocket mirror on a handle will let you see down into the tops of shielded tubes in far-off corners without taking the chassis out of the cabinet. Be sure to use a wood dowel or other nonconducting handle.—*Lance Werner, Cleveland.*

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9 TEST FOR SHORTS BETWEEN ADJACENT TUBE ELEMENTS

3 TEST FOR SHORTS. Plug the short-test leads into adjacent jacks of J1 to check continuity between those two elements. Jump one lead around the other to test other elements. Steady glow of neon lamp indicates short.

4 CHECK TUBE QUALITY. Make sure patching plug is in right socket (6CB6 is an amplifier) and insert jumper plug P1 into socket J1. Set shunt to calibration number for tube type. Meter reading above mid-scale is good.

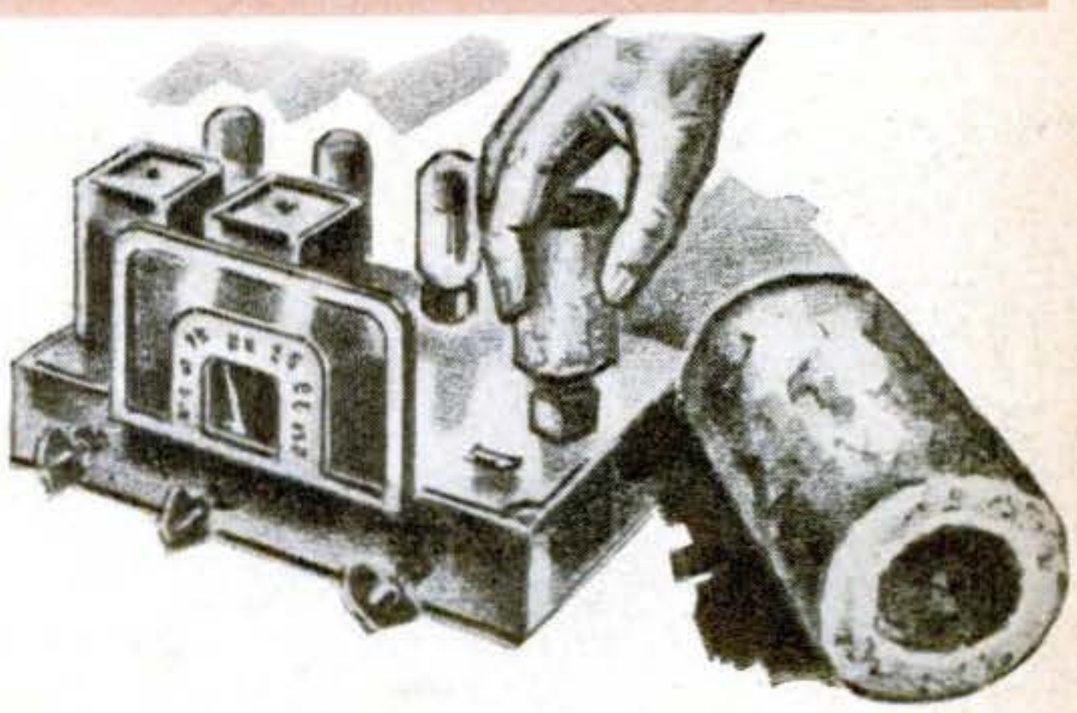
CALIBRATION TABLE

TUBE	TYPE OR SECTION	FIL. TAP	PIN CONNECTIONS (TO J2) F	F	K	G1	G2	G3	P	SHUNT SET'G	PATCHING PLUG (Step 11)
6H6	diode	6.3	2	7	8	—	—	—	5	9	DIODE✣
	"	"	"	"	4	—	—	—	3	9	" ✣
6J5	triode	6.3	2	7	8	5	—	—	3	26	AMP
6J6	triode	6.3	3	4	7	5	—	—	2	18	AMP
	"	"	"	"	"	6	—	—	1	18	"
6K6	pentode	6.3	2	7	8	5	4	—	3	22	AMP
6L6	beam power	6.3	2	7	8	5	4	—	3	20	AMP
6S4	triode	6.3	4	5	2	6	—	—	9	18	AMP
6S8	triode	6.3	7	8	2	★	—	—	6		AMP
	diode	"	"	"	5	—	—	—	3		DIODE✣
	"	"	"	"	2	—	—	—	4		" ✣
	"	"	"	"	"	—	—	—	1		" ✣
6SA7	oscillator	6.3	2	7	6	5	—	—	4	17	AMP
	pentode	"	"	"	"	8	4	5	3	28	"
6SC7	triode	6.3	7	8	6	4	—	—	5	50	AMP
	"	"	"	"	"	3	—	—	2	50	"
6SG7	pentode	6.3	2	7	3	4	6	—	8	17	AMP
6SH7	pentode	6.3	2	7	3	4	6	—	8	17	AMP
6SJ7	pentode	6.3	2	7	5	4	6	3	8	28	AMP
6SK7	pentode	6.3	2	7	5	4	6	3	8	29	AMP
6SL7	triode	6.3	7	8	3	1	—	—	2	44	AMP
	"	"	"	"	6	4	—	—	5	44	"
6SN7	triode	6.3	7	8	3	1	—	—	2	28	AMP
	"	"	"	"	6	4	—	—	5	28	"
6SQ7	triode	6.3	7	8	3	2	—	—	6	50	AMP
	diode	"	"	"	"	—	—	—	5	8	DIODE✣
	"	"	"	"	"	—	—	—	4	8	" ✣
6T8	triode	6.3	4	5	7	8	—	—	9	48	AMP
	diode	"	"	"	7	—	—	—	6	9	DIODE✣
6T8	diode	6.3	4	5	3	—	—	—	2	9	DIODE✣
	"	"	"	"	7	—	—	—	1	9	" ✣
6U4	rectifier	6.3	7	8	3	—	—	—	5	14	RECT
6V6	beam power	6.3	2	7	8	5	4	—	3	18	AMP
6W4	rectifier	6.3	7	8	3	—	—	—	5	7	RECT
6W6	beam power	6.3	2	7	8	5	4	—	3	14	AMP
6X4	rectifier	6.3	3	4	7	—	—	—	1	10	RECT
	"	"	"	"	"	—	—	—	6	10	"
6X5	rectifier	6.3	2	7	8	—	—	—	3	6	RECT
	"	"	"	"	"	—	—	—	5	6	"
6X6	beam power	6.3	2	7	8	5	4	—	3	15	AMP
7F8	triode	6.3	2	7	5	8	—	—	6	17	AMP
	"	"	"	"	4	1	—	—	3	17	"
7N7	triode	6.3	1	8	7	5	—	—	6	22	AMP
	"	"	"	"	2	4	—	—	3	22	"
7X7	triode	6.3	1	8	4	3	—	—	2	55	AMP
	diode	"	"	"	"	—	—	—	5	8	DIODE✣
	"	"	"	"	7	—	—	—	6	8	" ✣
12BY7	pentode	12.6	4	5	1	2	8	3	7	16	AMP
25L6	beam power	25	2	7	8	5	4	—	3	16	AMP
25Z6	rectifier	25	2	7	4	—	—	—	3	14	RECT
	"	"	"	"	8	—	—	—	5	14	"
35L6	beam power	35	2	7	8	5	4	—	3	16	AMP
35W4	rectifier	35	3	4	7	—	—	—	5	8	RECT
35Z5	rectifier	35	2	7	8	—	—	—	5	8	RECT
50B5	pentode	50	3	4	2	7	6	—	5	17	AMP
50C5	pentode	50	3	4	1	2	6	—	7	17	AMP
50L6	beam power	50	2	7	8	5	4	—	3	16	AMP
117Z3	rectifier	117	3	4	6	—	—	—	5	7	RECT

✣-Press meter-shunt switch in test 12 ⁂Use external jumper to plate cap ★Use external jumper to grid cap

Hot Tubes Pulled Comfortably by Car-Radio Vibrator Lining

You can get an easy grip on hot or tight radio tubes with a rubber puller like this one. It is simply the sponge-rubber lining from an old auto-radio vibrator. You can probably find one easily in the junk box of a radio-repair shop.—*Hugh Lineback, Stillwater, Okla.*



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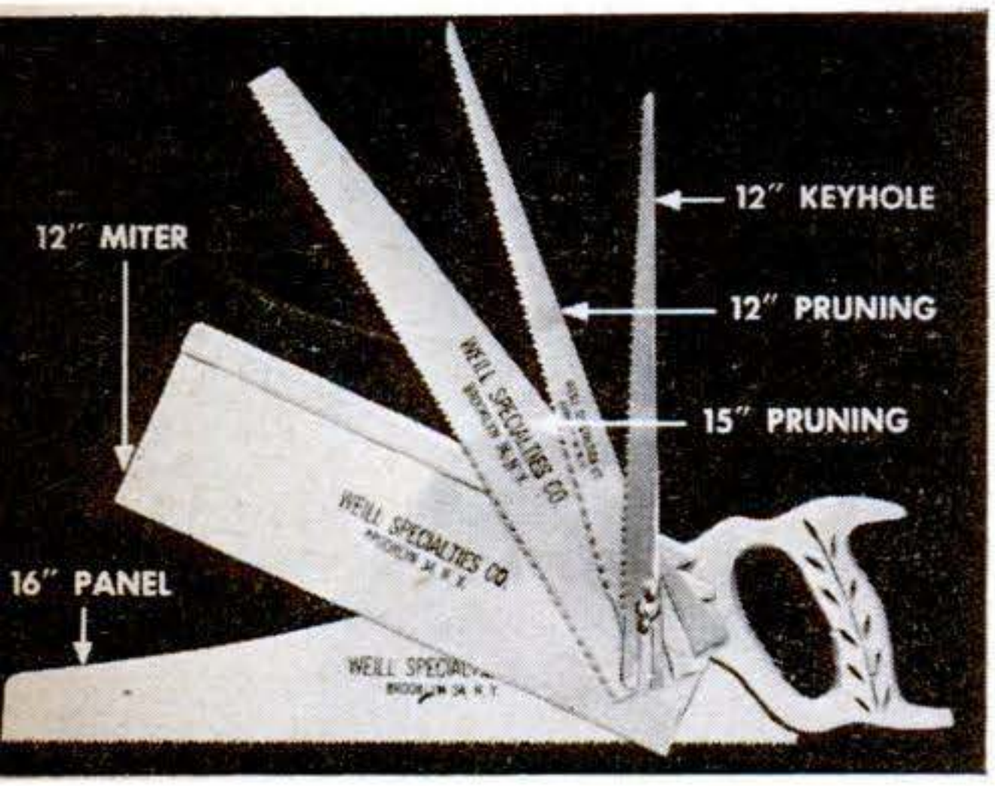
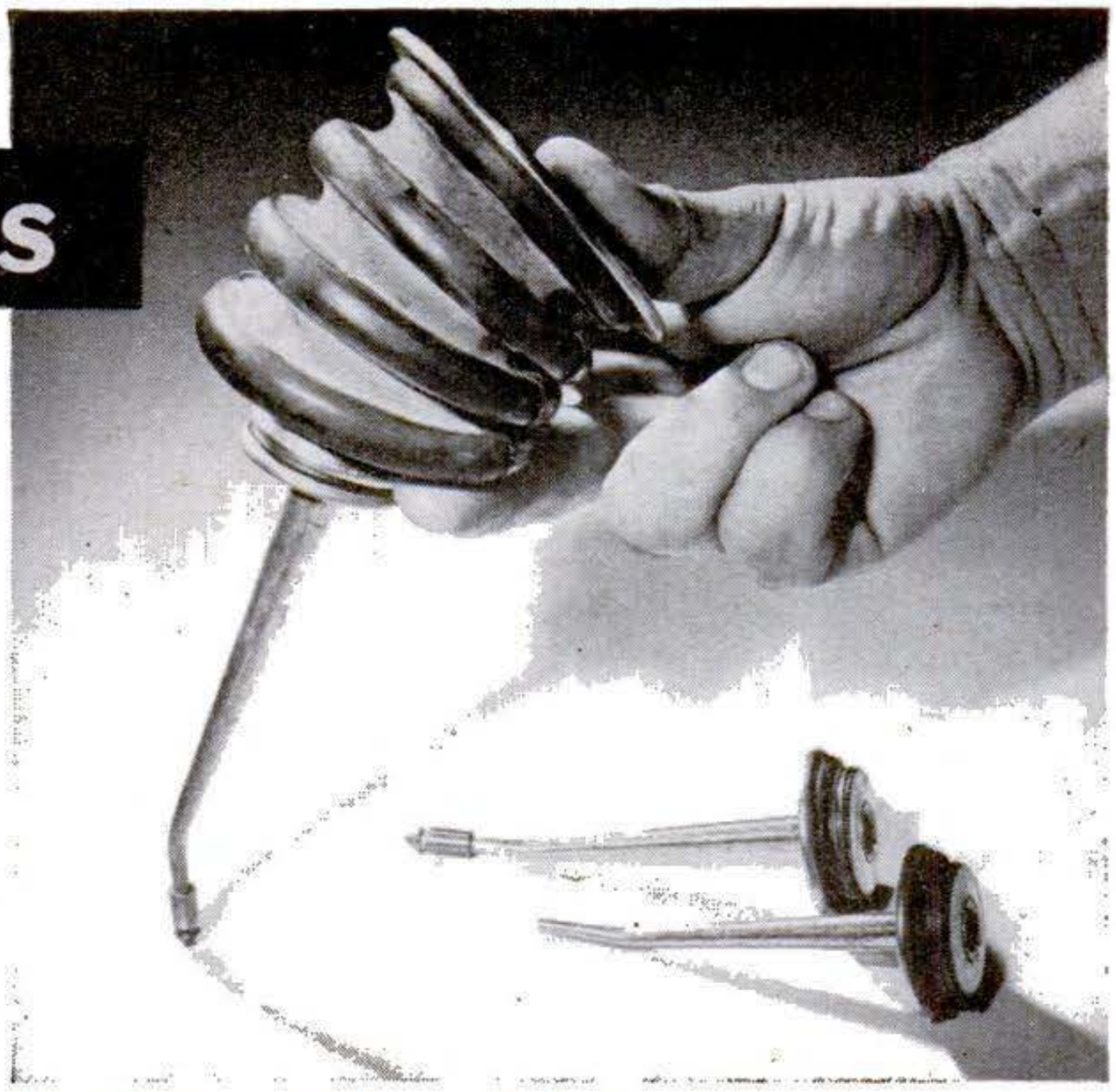
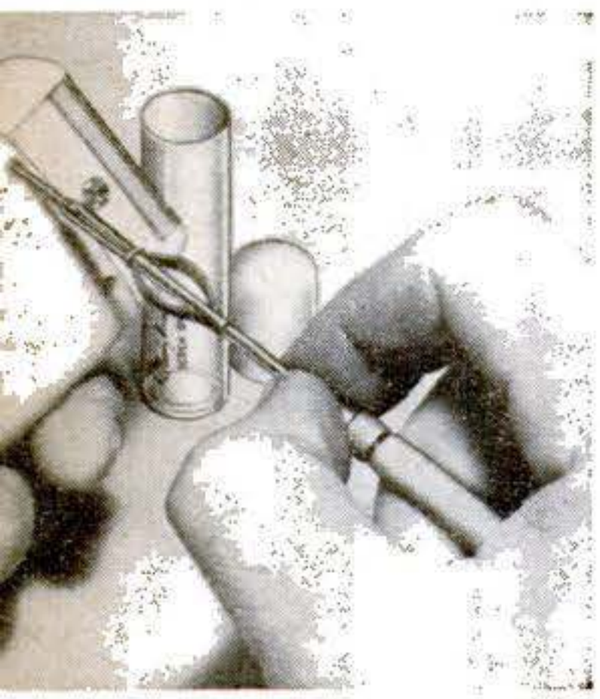
New Tools



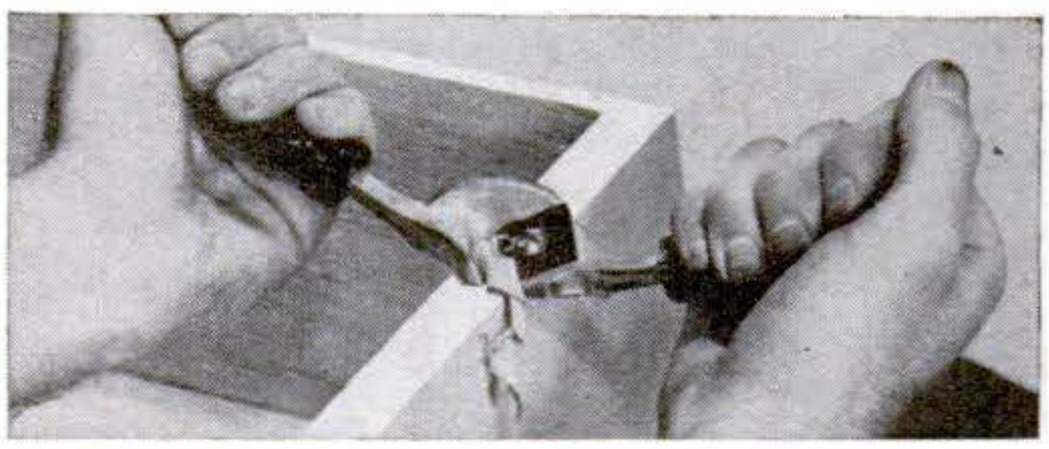
1. Saw Set Has Five Blades. A wing nut and bolt fasten the hardwood handle to any of this saw set's five blades, giving you a choice for the job at hand.



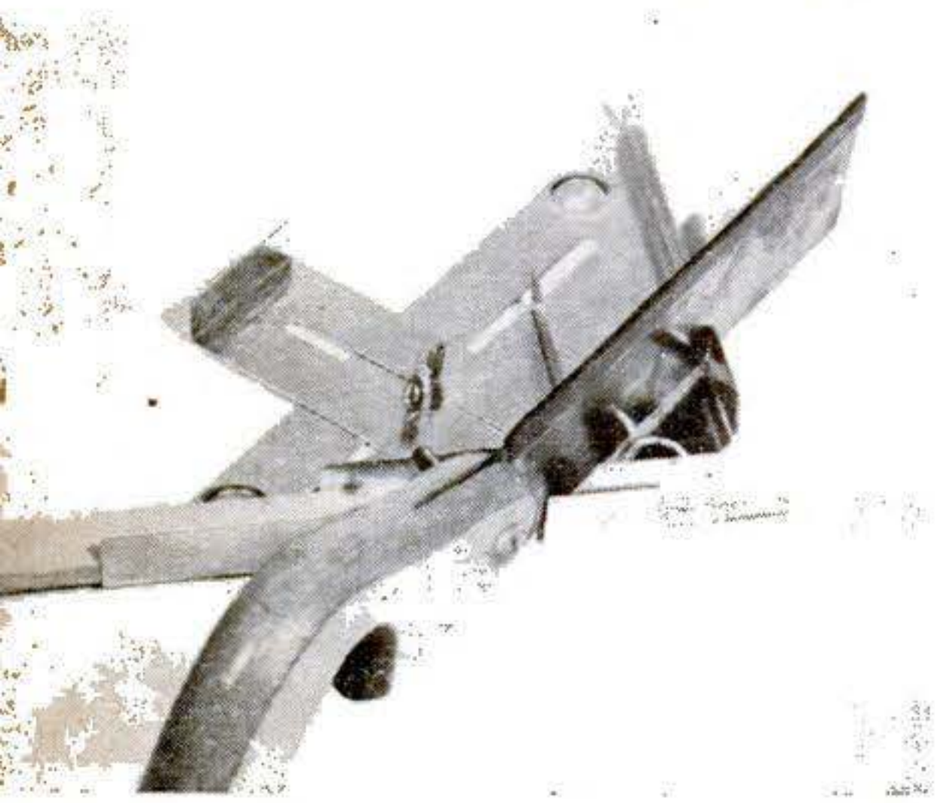
2. Rubber Oilcan Gets Last Drop. To avoid squirts and dribbles, the Flexoil oiler has a synthetic-rubber bellows for sides. Pressing the base gives a steady stream—even with oil as thick as SAE 90—down to the last drop. Spouts are interchangeable.

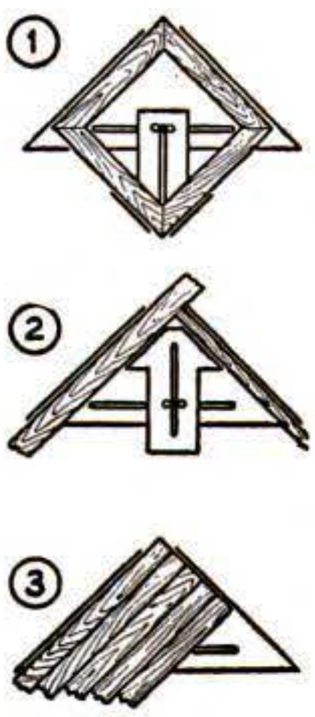


3. Screwdriver Grips Screws. Spring "fingers" on this small screwdriver hold tiny screws where hands can't reach. The kit includes swivel-top handle, locking chuck and two interchangeable screwdriver blades, one 1¾" and the other 2½" long.



4. Drawknife Works Like Plane. A cross between a plane and a drawknife, this new tool will do small, hard-to-get-at jobs where a conventional plane can't go.





5. Miter Box Serves as Clamp. Besides holding wood for accurate 90° and 45° cuts, the Corner-mite will also clamp pieces for assembling miter or butt joints. The large part makes a try square. The slotted corner guide can be reversed (1) and the assembly used to clamp a small frame in one operation. Slots make two-way adjustment possible. Because of this, wide and narrow wood can be clamped together (2). With squared ends butted against one side (3), identically spaced holes can be drilled in several pieces.

Further information on these products can be obtained from: 1. Weill Specialty Co., 1650 E. 38th St., Brooklyn 34; 2. Tomer Co., 4246 Abbott Ave. S., Minneapolis; 3. Moody Machine Products Co., Culver & Willard Ave., Providence, R.I.; 4. Hunter Tool Co., Whittier, Calif.; 5. Mikin Products, Inc., 568 Union Ave., Brooklyn 11.

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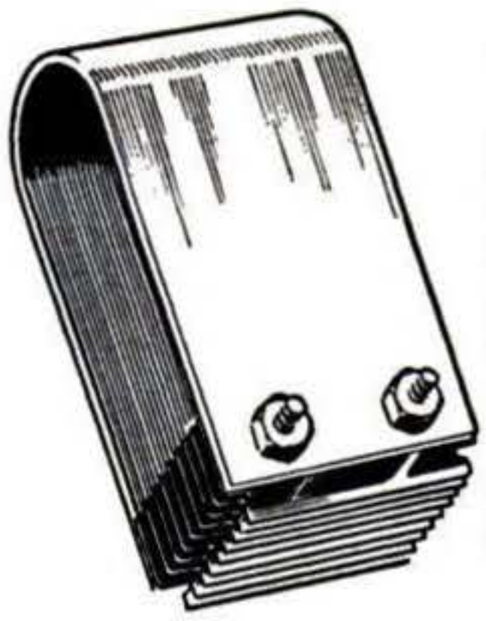
Razor Blades Serve as Scraper



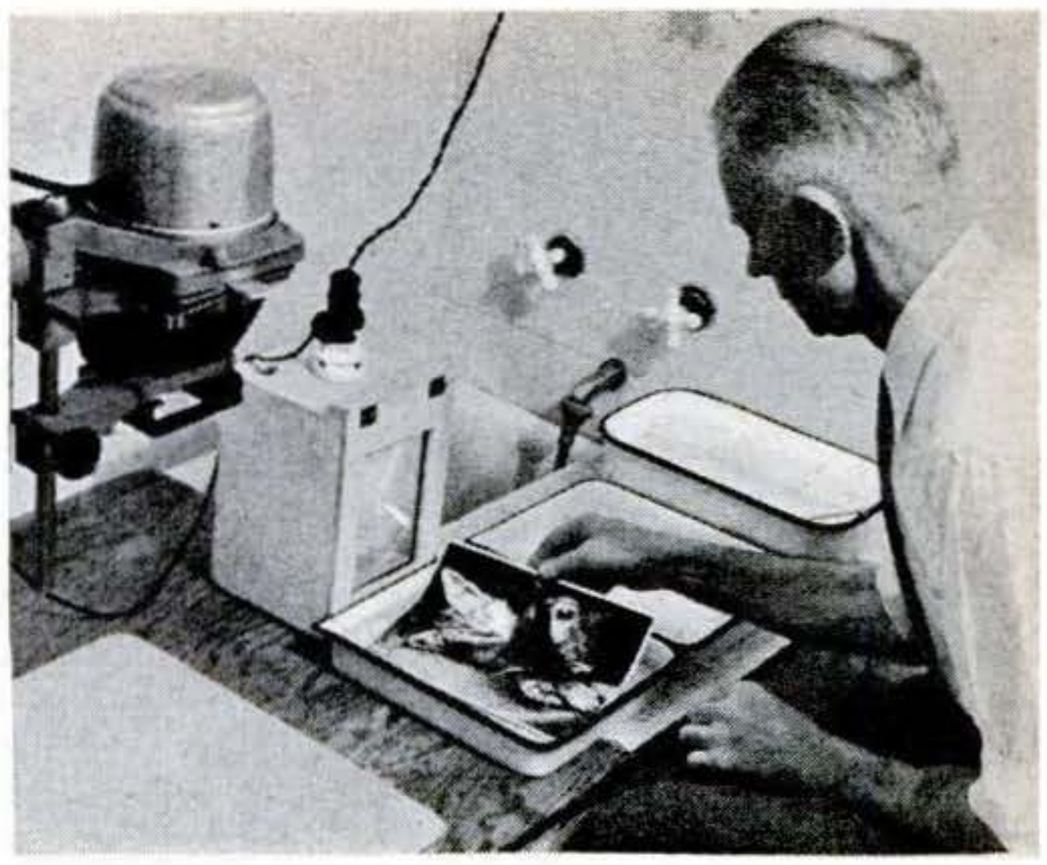
A STACK of old razor blades separated by cardboard spacers and held in a U-shaped metal strap will make a good scraper. It can be used on copper or aluminum and plastics as well as wood.—*Ken Olin, Marquette, Mich.*

Timer Turns Off Soldering Iron

IF YOU forget to turn off a soldering iron, a burned tip or a fire may result. I plug my iron into an electric timer. If the timer cuts it before I'm through, I just turn it on again; if I forget it completely, the timer backstops me.—*Melvin Leaf, Walker, Minn.*

Magnet Cleans Deep Holes

IT IS often tough to remove chips from vertical blind holes in big iron castings. I use a chip-fishing tool made by magnetizing a round file from which the teeth have been ground. It is a handy "picker-upper" too.—*C. W. Close, Sycamore, Ohio.*



Bathtub Doubles as Darkroom

A SHEET of ⅝" plywood will make your bathtub a handy and quickly assembled bench for photo finishing. Cleats on the underside rest against the inside rim of the tub to keep the plywood from slipping. One corner is cut away so that prints can be slipped from the fixing bath into wash water in the tub. For safety, complete all electrical connections before switching on the current and turn the current off before disassembling the hookup each time you use it.—*O. A. Nelson. Seattle.*

Watch Out... in NOVEMBER for firearms. Watch any time, not only in November. Not long ago an ROTC instructor finished a lecture on safety with firearms, then shot himself in the arm.

YEAR after year, a large proportion of accidental deaths between the ages of 15 and 24 is caused by firearms. These accidents usually occur as someone prepares to clean a gun, or drops it, or leans it against a fence, or jars it in a car. **Never look into the muzzle to examine a barrel, look into the breech end. Never play with firearms. When you carry a loaded gun, keep it on "safety." Before climbing a fence, break the gun or open the breech and put it over fence first. In the home, where half of all firearms accidents occur, weapons should be kept locked up—and unloaded.**

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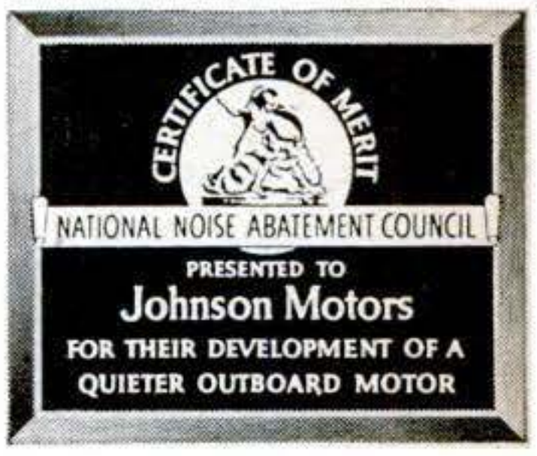

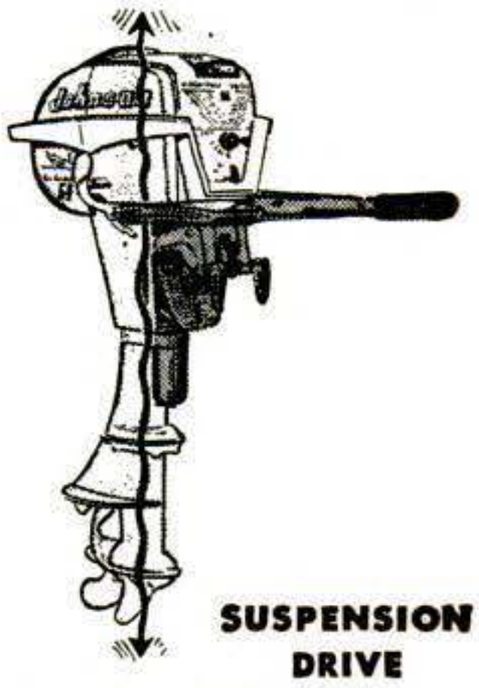

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Quit Skidding! Build a Sander

Grit poured under the rear wheels will give you traction when you need it most. This writer equipped his car for $5.

By E. F. Lindsley

A LIGHT snow had given the streets the glassy surface that pays off in work for the body shops. When the stop light showed green, my tires slipped and screeched and I got going up the grade only with difficulty. The driver in the lane beside me pulled away surely and smoothly. Stretching my neck at the next light, I finally spotted his secret—the nozzle of a wheel sander like the ones locomotives and big trucks have had for years.

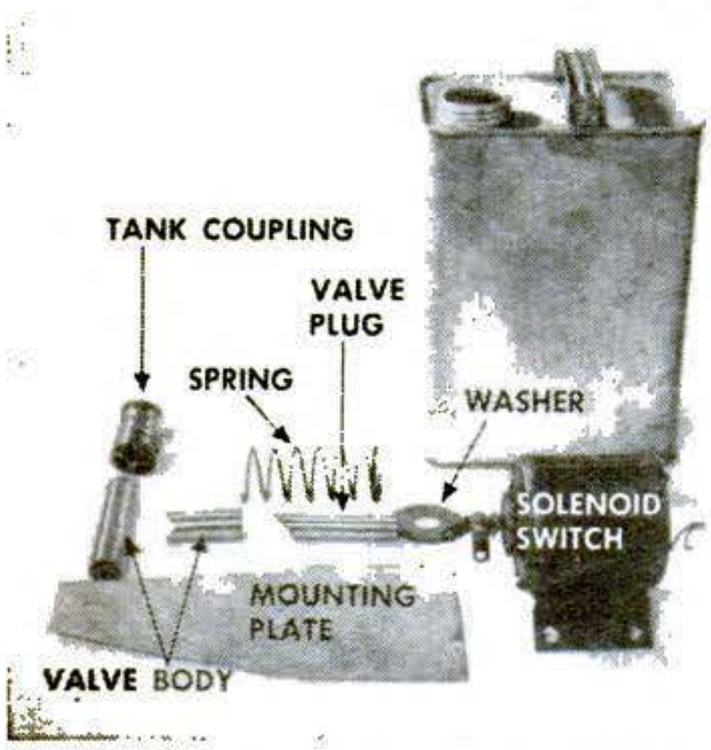
That experience was enough. I decided I wanted wheel sanders, too. It came as a jolt, however, to learn how much they cost—strictly de luxe on my budget. So I set out to get them for less.

I did. A five-buck bill easily covered the cost of the ones I built and installed myself. Less will do it for you if you have a well-stocked junk box.

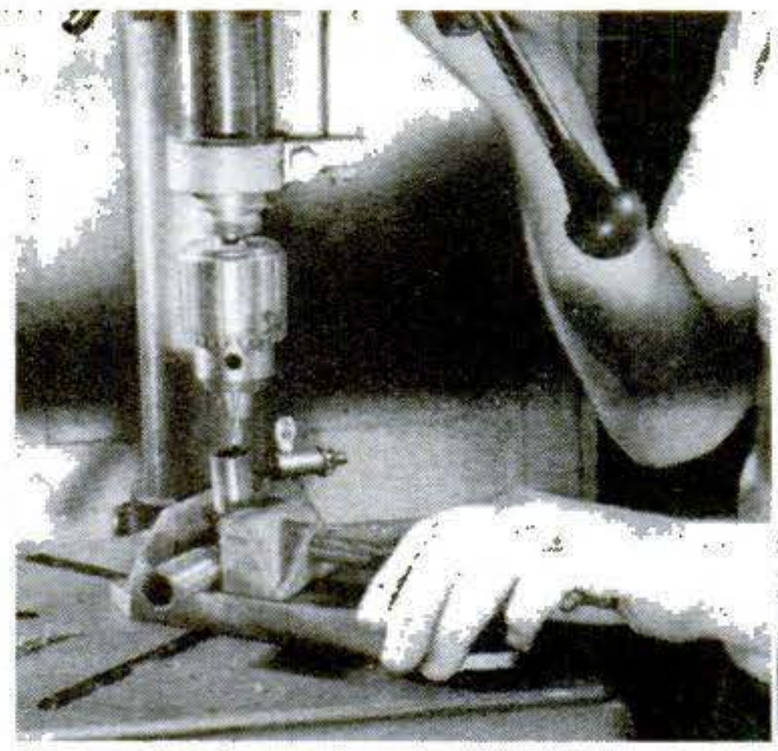
What will they do? Sanders are no substitute for careful driving. Neither do they outmode chains. In deep snow, chains are the only answer. Sanders are most useful on glare ice and hard-packed snow—or when you need to get out of a steep driveway.

They can shorten stopping distance as much as 30 percent when used in conjunction with the usual pedal-pumping action recommended for braking on ice. At a dead stop, they won't help you start unless you can roll far enough to get your tires onto the sanded area. However, if you get jammed up against the curb and can't pull away, it's not too hard to dump a handful of sand and then get out and kick it under the tire.

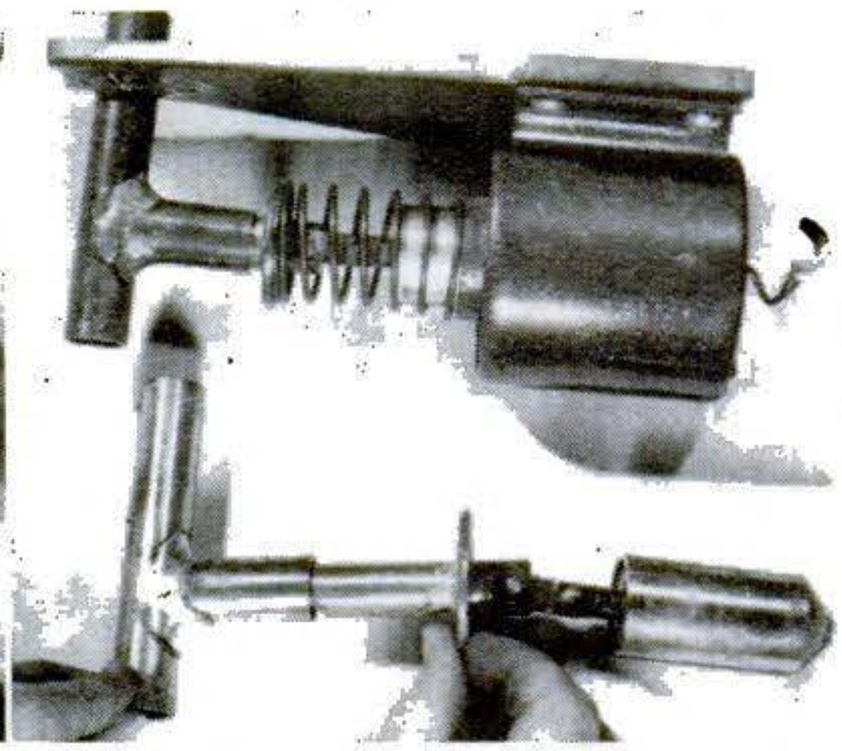
The big payoff is the almost instantaneous



THE MAKINGS of one sander include a solenoid switch with a clevis (once linked to a starter pinion), parts of valve body cut from electrical conduit, and a piece of ⅝" shafting for the plug. Sharp 45° end of this cuts off flow of grit without jamming.



FILE RIGHT-ANGLE PART of valve body to fit main piece and solder or braze together. Then drill a series of small holes around side as shown, knock out the waste, and clean up edge with file or hand grinder so that the valve plug can enter freely.



FILE END of valve plug to fit solenoid clevis, join with a rivet. Solder on washer as spring seat. Assemble with sloping face of valve plug down. If spring is too stiff for solenoid pull, trim off a turn. Mounting-plate edges are bent up, corners soldered.

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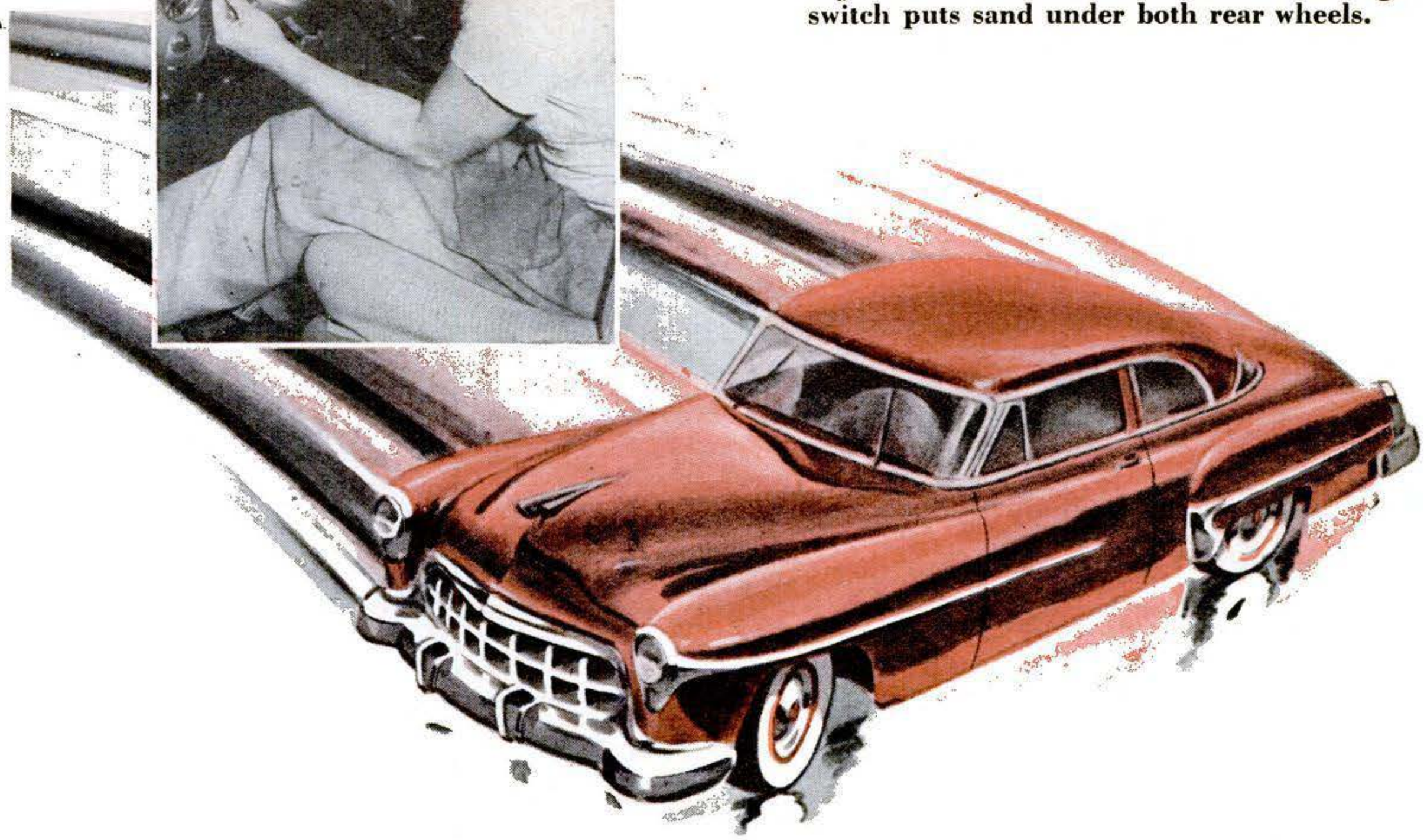
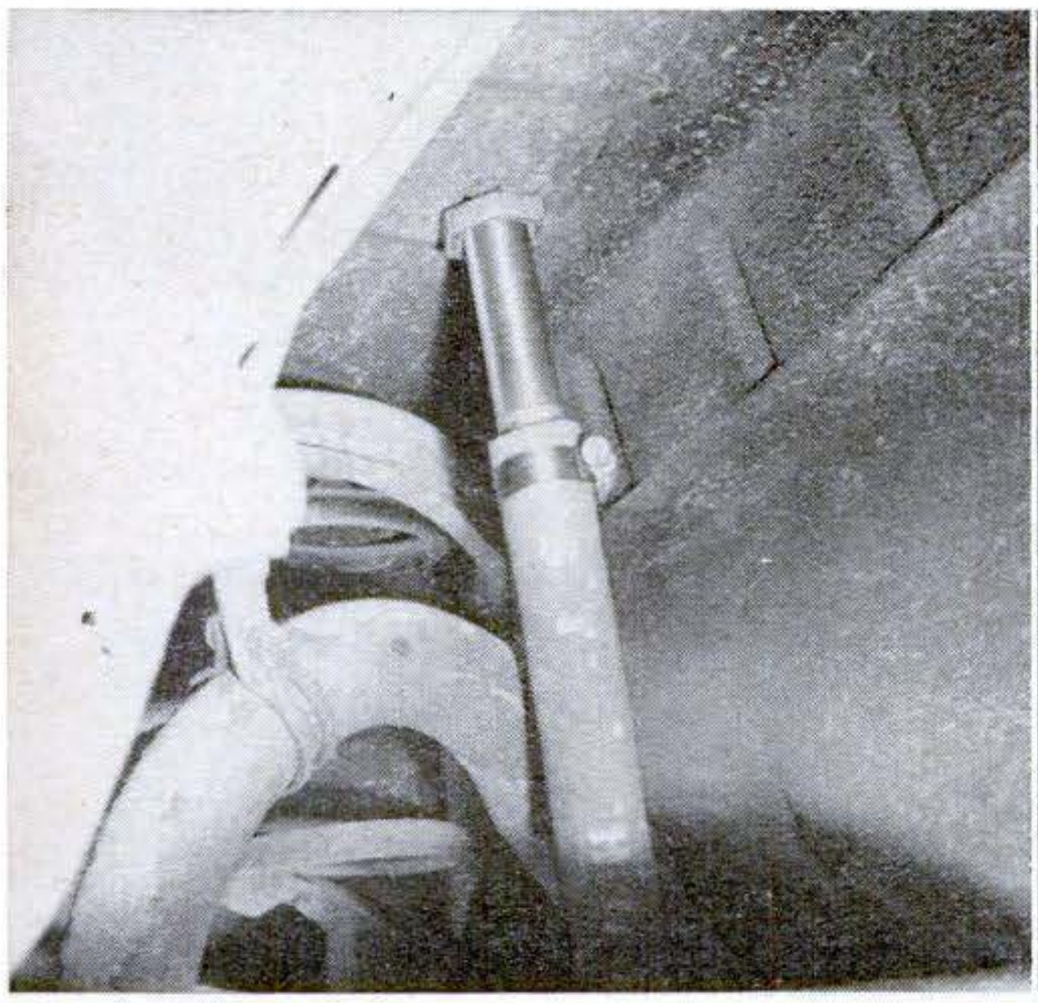
A TURN-LIGHT SWITCH mounted on the steering column controls the flow of sand. Single switch puts sand under both rear wheels.

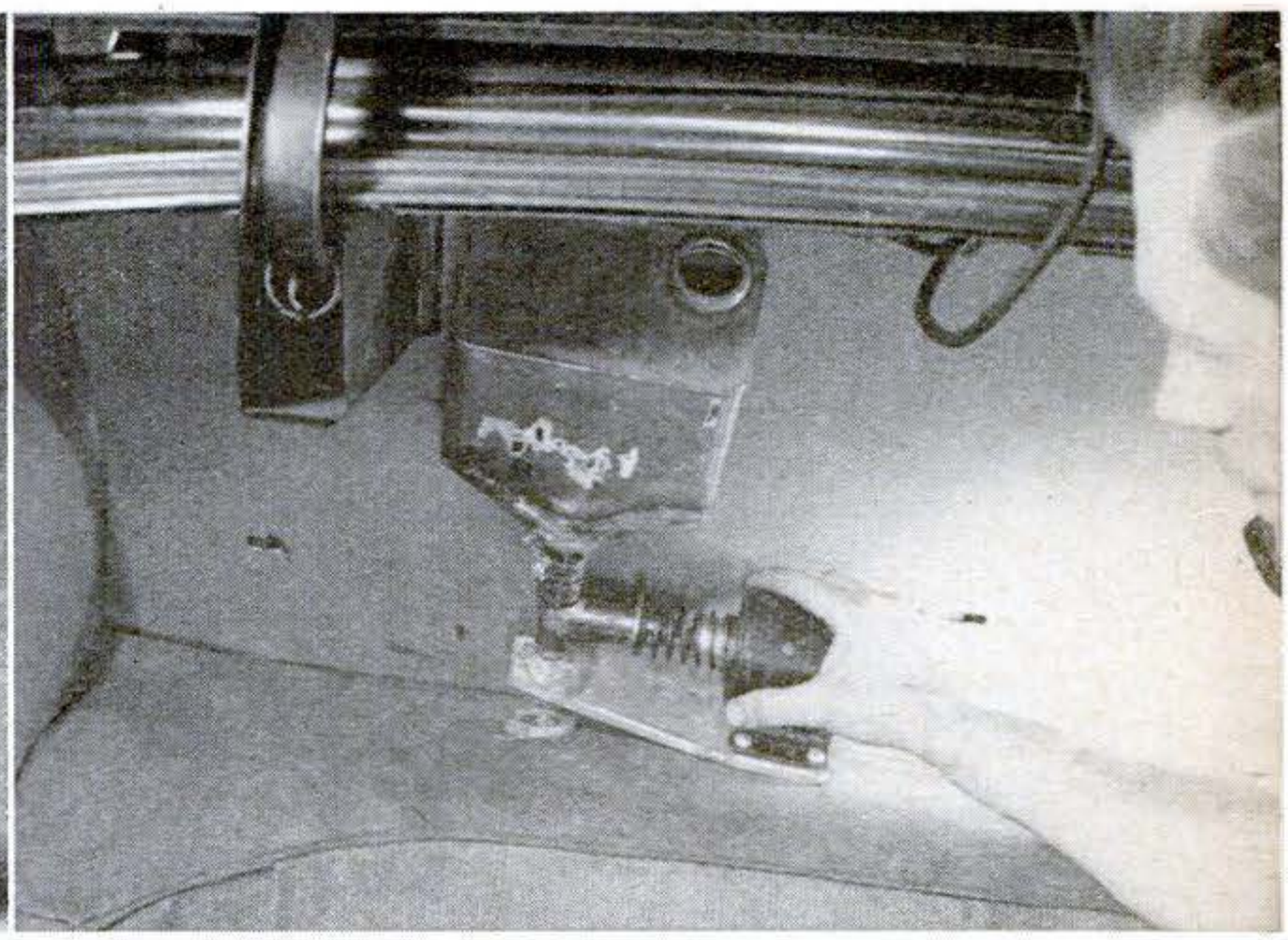


response of a car starting to broadside. Provided your speed is at all reasonable, sanders will promptly get the back end around where it belongs. Then there's the brake-loaded slide into a car stopped ahead of you. Sanders will save you a bump, embarrassment and perhaps a repair bill.

But it isn't sand. Sanders don't use sand at all, but a very coarse grit made from slag or what have you. Ordinary sand won't work; it packs, lumps, absorbs moisture and freezes. Its small grains jam the valve solid. Don't even try it. Go to an accessory store catering to truckers and buy the proper grit.

Just how and where you mount your sanders will depend on the shape of your car trunk. If it calls for a pair of small tanks as mine did, make them easily removable for filling. If you can find room for big metal hoppers, their extra weight will require





HOSE IS CLAMPED on pipe nipple held in hole in trunk floor with pipe nuts above and below (left). Hopper and valve unit slip into pipe nipple a short way (right) but can be removed for refilling. This rig snaps into place under deck, but could be held by spring.

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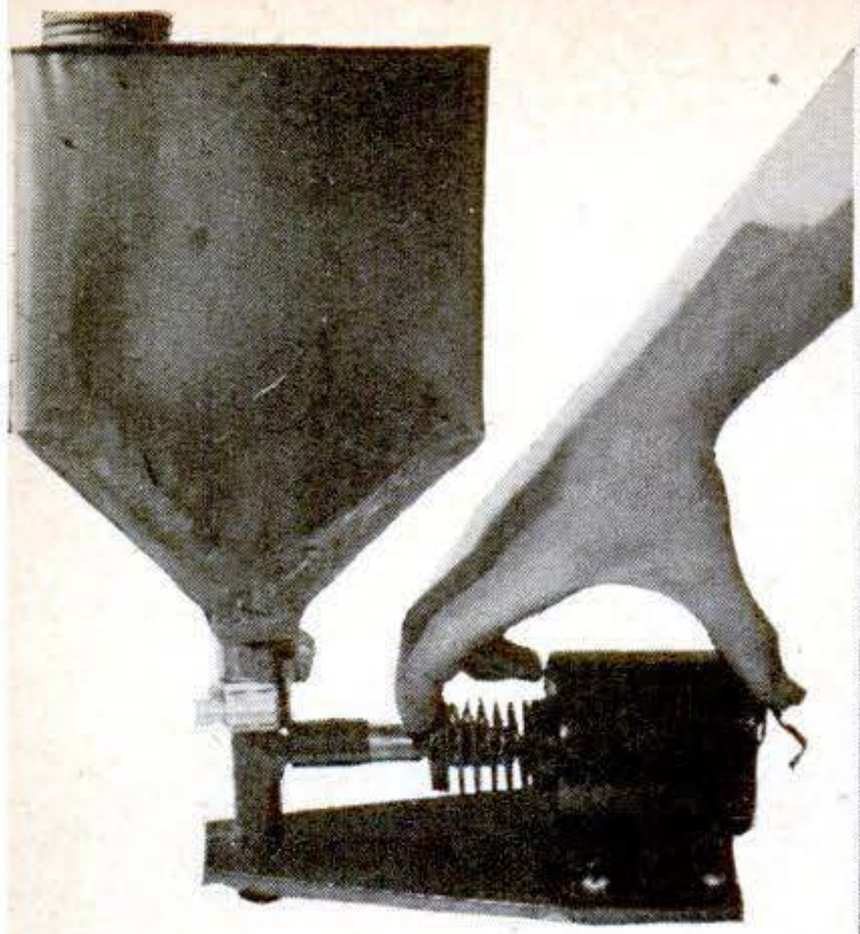
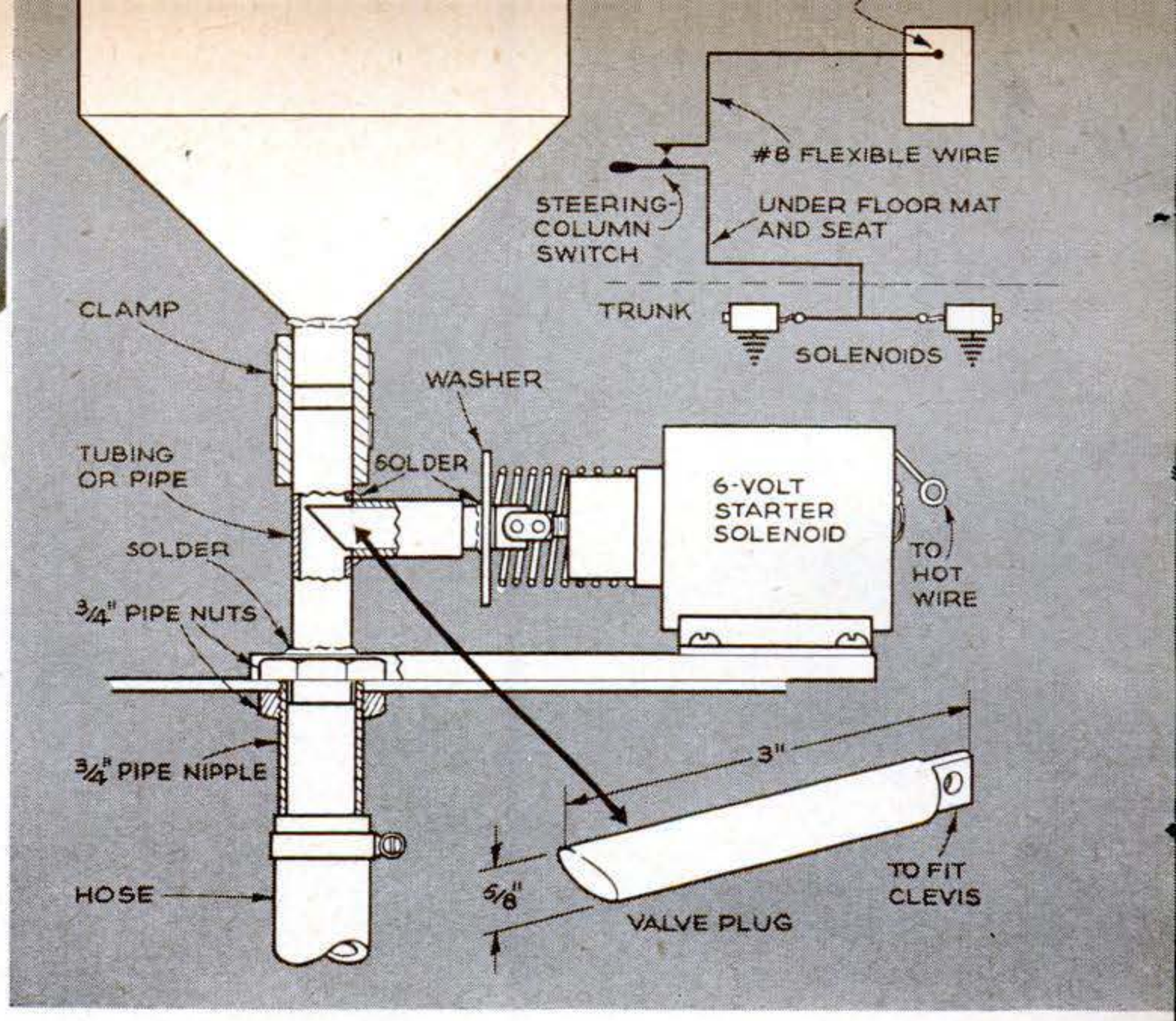
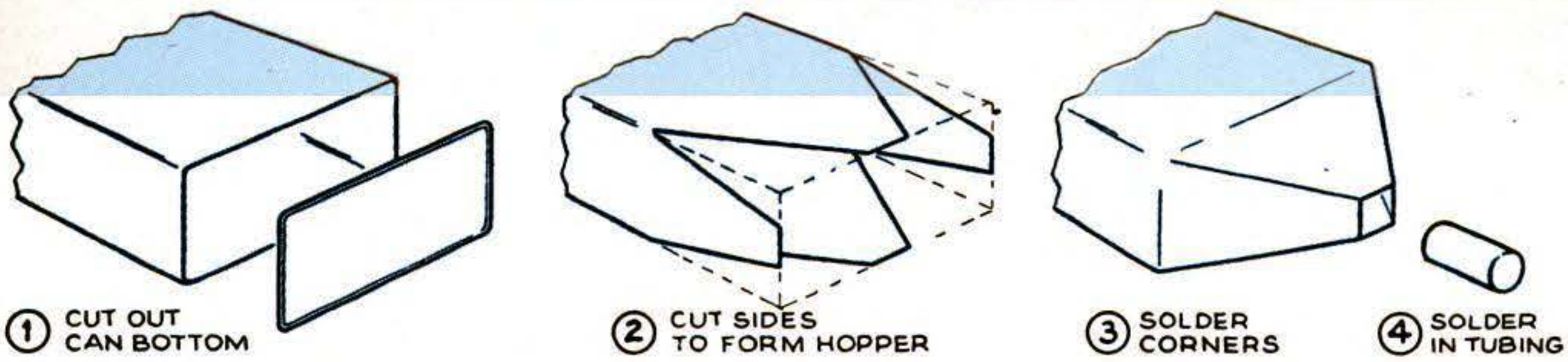




CUT CAN to make hopper, and solder in tubing. Unit above is ready for trial. Solenoid action should be snappy, spring strong enough to push plug back reliably when current is cut.



secure mounting, possibly with strips of inner tube. Big tanks won't need filling so often, but after the novelty wears off you won't use grit as rapidly as you'd think.

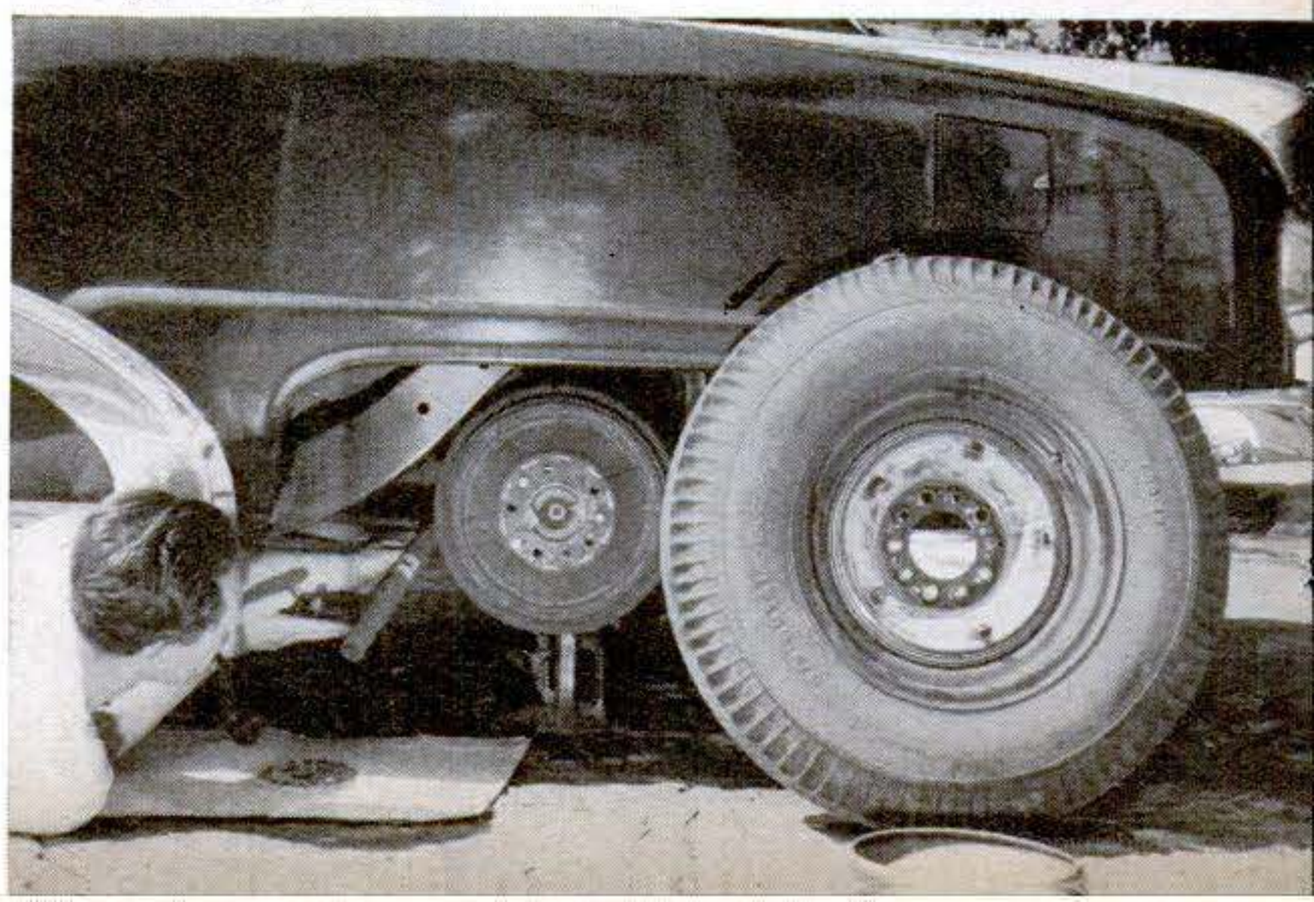
The valve control. Although a cable-operated valve would work, quick response is so vital that you haven't time to tug on cable pulls. I bought two old Buick starter solenoids for a buck each, stripped away the relay parts from the back of both, and hooked the hot wire from the control switch to the one terminal with the big connector eye. The ends of the other two wires are screwed down against the housing.

In picking your solenoid switches, get the kind with a clevis, which simplifies the valve hookup. You may prefer to leave on and use the solenoid relay, because your control switch will then have to handle only a small current.

Prowling around the wrecking yards, I bought a flip-type directional-signal switch. Not needing the stuff that flips it back after you turn a corner, I stripped the unit to the switch and indicator light. Since the two sanders work together, only one pole of the switch is hooked up.

Wiring is simple. Hook up to a hot terminal somewhere, run the wire to the switch, down the steering column and under the floor mat to the trunk, and branch a line to each solenoid. The car frame provides the return side of the circuit, so be sure both solenoids are securely grounded.

SANDING GRIT must drop just in front of wheels, but hoses must not touch tires. Because bumper jack shifts body out of alignment, it was used only to put another jack under axle. Hoses should be straight; bends or sags trap sand.



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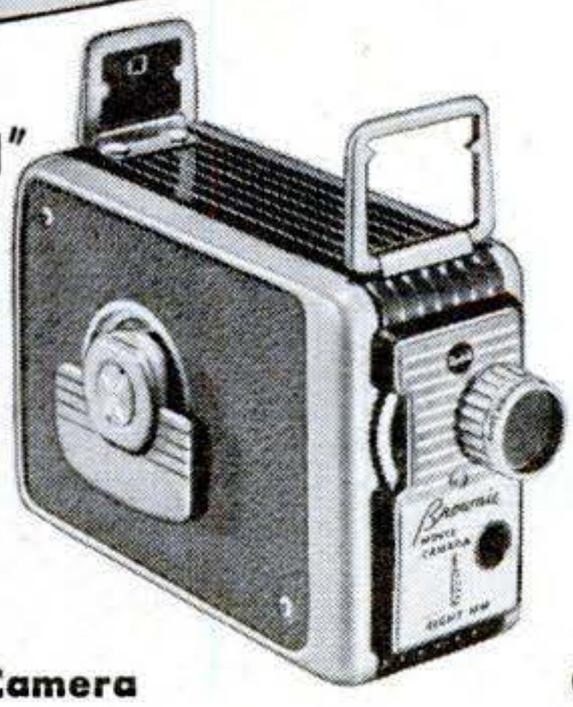

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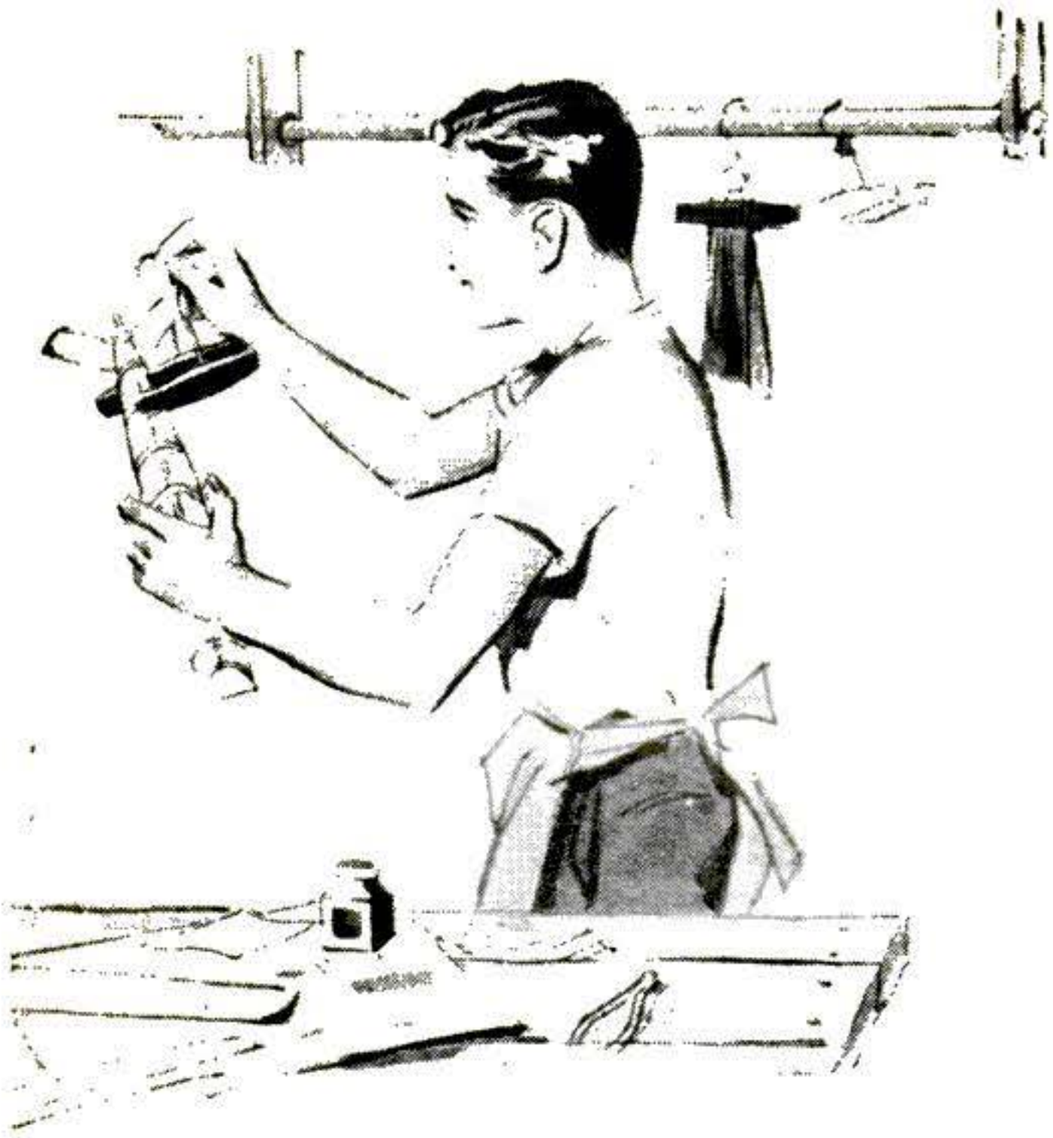


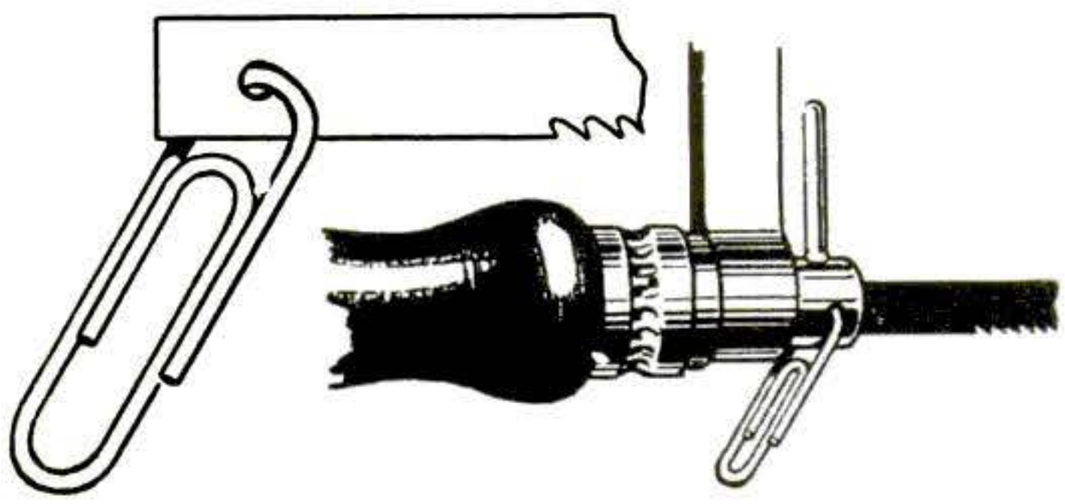
Clothes Hanger Clamps Wood

AN ORDINARY clip-type pants hanger can be pressed into emergency use as a clamp to hold small wood parts together while they are being glued. The felt strips found on most of these hangers automatically pad the jaws and prevent marring.—*Ted Otsu, Vancouver, B.C.*

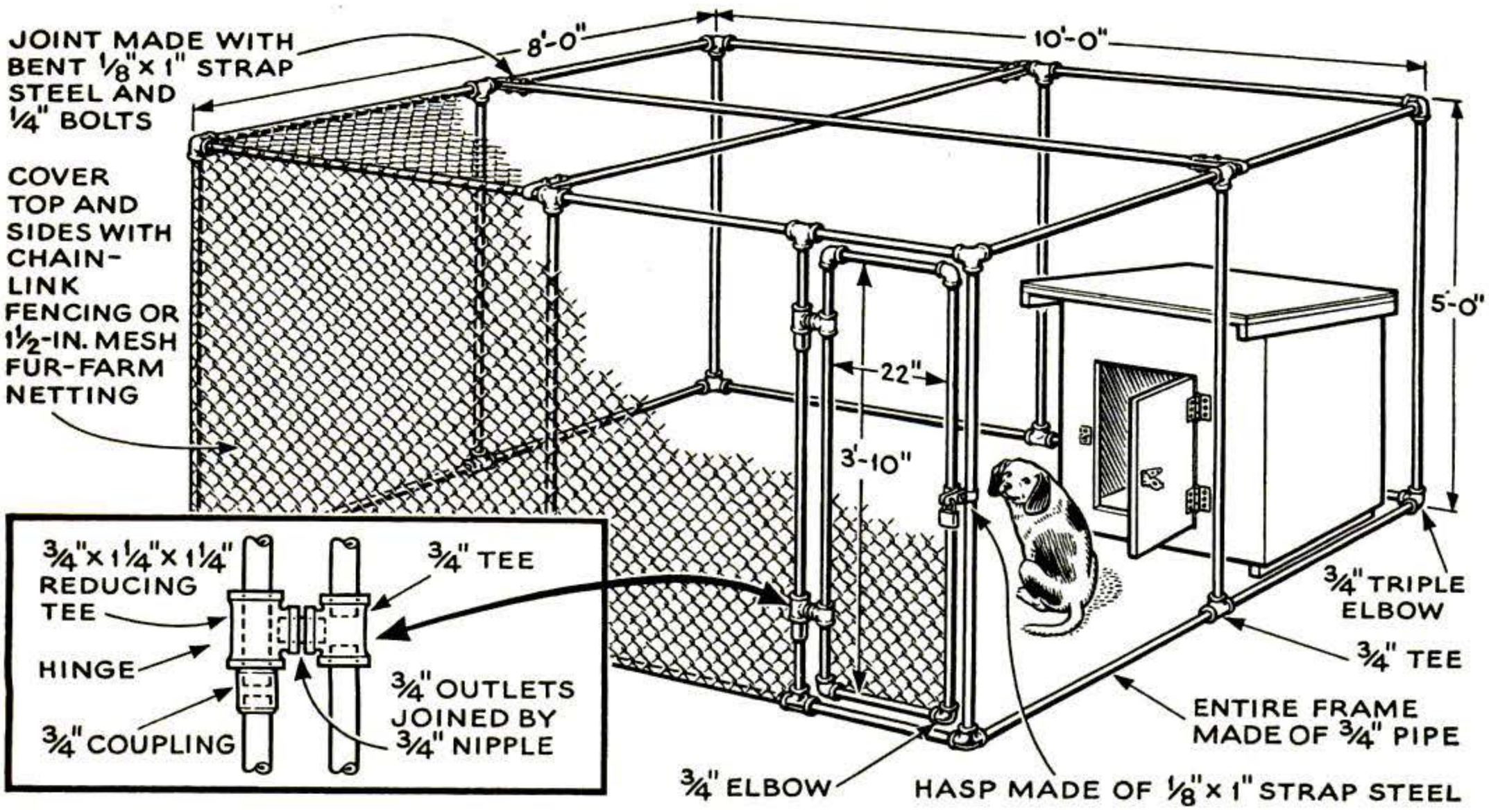
Lighter Wheel Made on Lathe

A WHEEL for a nonautomatic cigarette lighter can be made by turning drill rod to the wheel diameter, then cutting a 36-to-40-t.p.i. right-hand thread about half the usual depth. Run the lathe slowly in back gear and roll a mill file over the threaded surface to bring up burrs. Drill the hole, cut off the wheel and harden.

Jigsaw Blades Changed Quickly



A PAPER clip inserted in the end of a jigsaw blade after the pin has been knocked out provides a handle to help speed blade changing. The clips also make convenient hooks for hanging up various types of blades for quick selection.—*Ken Olin, Marquette, Mich.*



Fence Wire Over Frame Built of Pipe Lets Dog Run

I WANTED to keep my dog from running loose, but I didn't want to lock him in the house or tie him up. By using ordinary fence wire and some scrap pipe and fittings, I built this kennel. It keeps the dog safe while still giving him plenty of room to run and play. The pipe was bought at junk yards, cut to length, then threaded by a plumber for a few dollars.—*James A. Shiminski, Worcester, Mass.*

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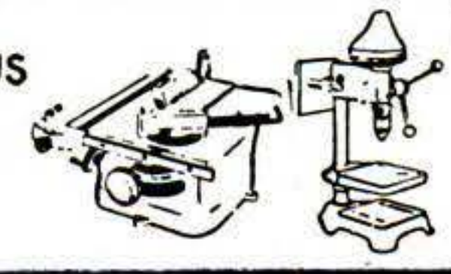

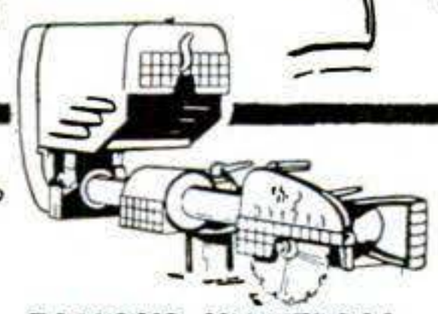

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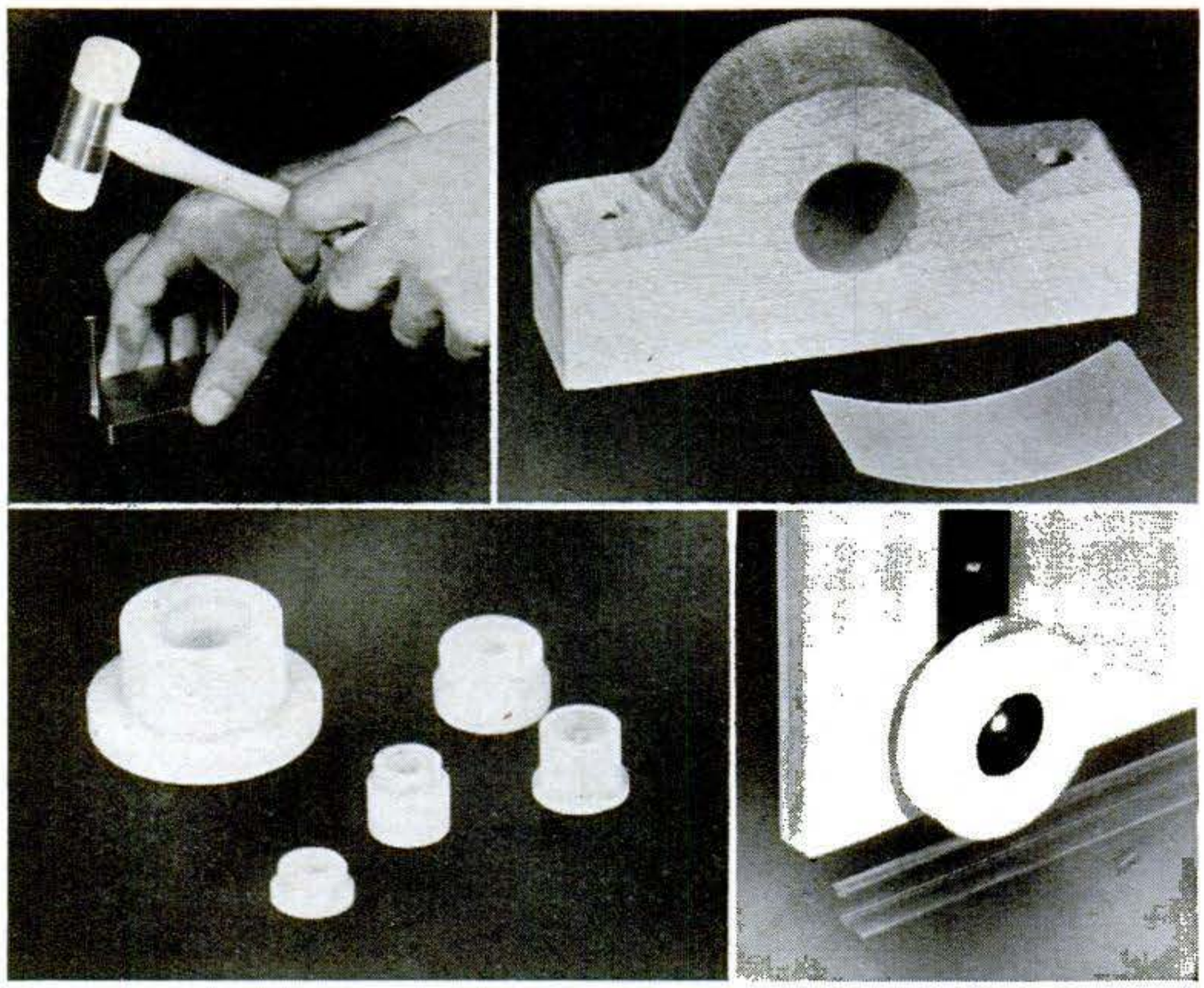
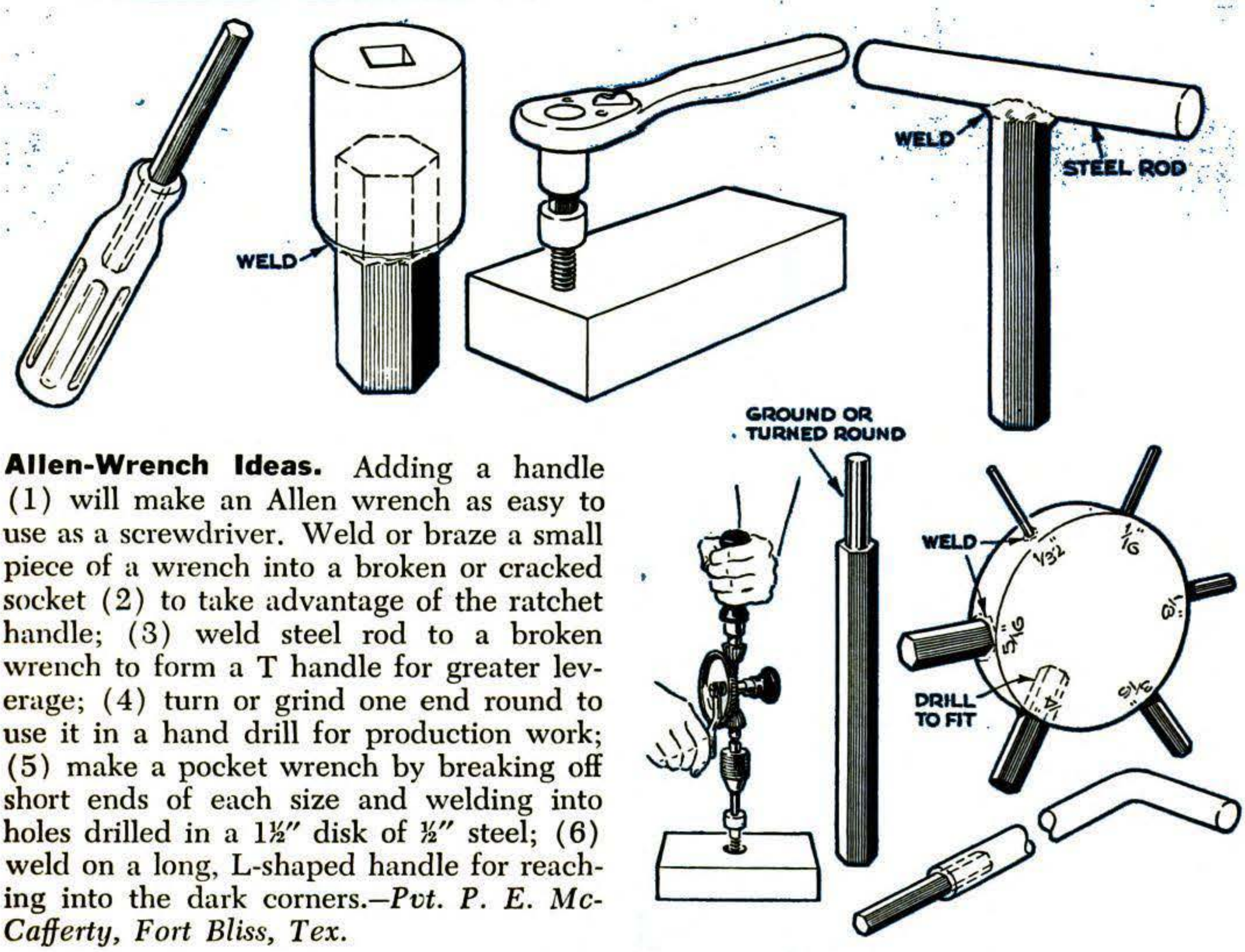


Shop Uses for Nylon. Available in various stock sizes as rod, sheet and tube, nylon is easily machined and can be used to good advantage in your shop. It will soften when heated, yet under certain conditions it is actually tougher than metal.

Here are some shop suggestions: (1) Impact hammer made of rod stock does not mar the work; (2) pillow-block bearing made of wood is lined with nylon sheet—requires no oil; (3) sleeve bearings or bushings turned from rod provide quiet, oil-free operation in light machinery; (4) rollers for cabinets or doors are quiet, long-lasting.

Nylon washers are excellent for eliminating end play in electric motors as they have a low friction coefficient and are not distorted by oil.—*Will Thomas, Buffalo.*



Allen-Wrench Ideas. Adding a handle (1) will make an Allen wrench as easy to use as a screwdriver. Weld or braze a small piece of a wrench into a broken or cracked socket (2) to take advantage of the ratchet handle; (3) weld steel rod to a broken wrench to form a T handle for greater leverage; (4) turn or grind one end round to use it in a hand drill for production work; (5) make a pocket wrench by breaking off short ends of each size and welding into holes drilled in a 1½″ disk of ½″ steel; (6) weld on a long, L-shaped handle for reaching into the dark corners.—*Pvt. P. E. McCafferty, Fort Bliss, Tex.*

 Please turn to page 238 for more shop ideas.

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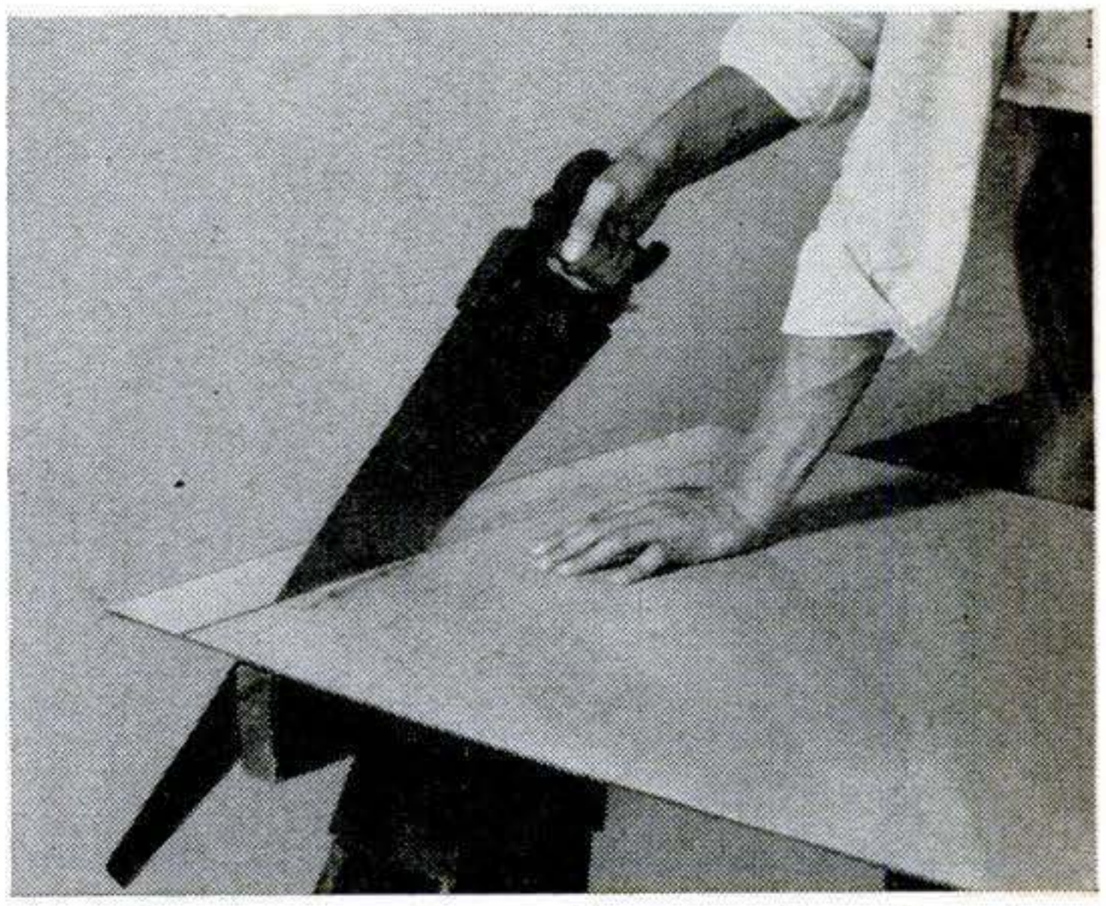
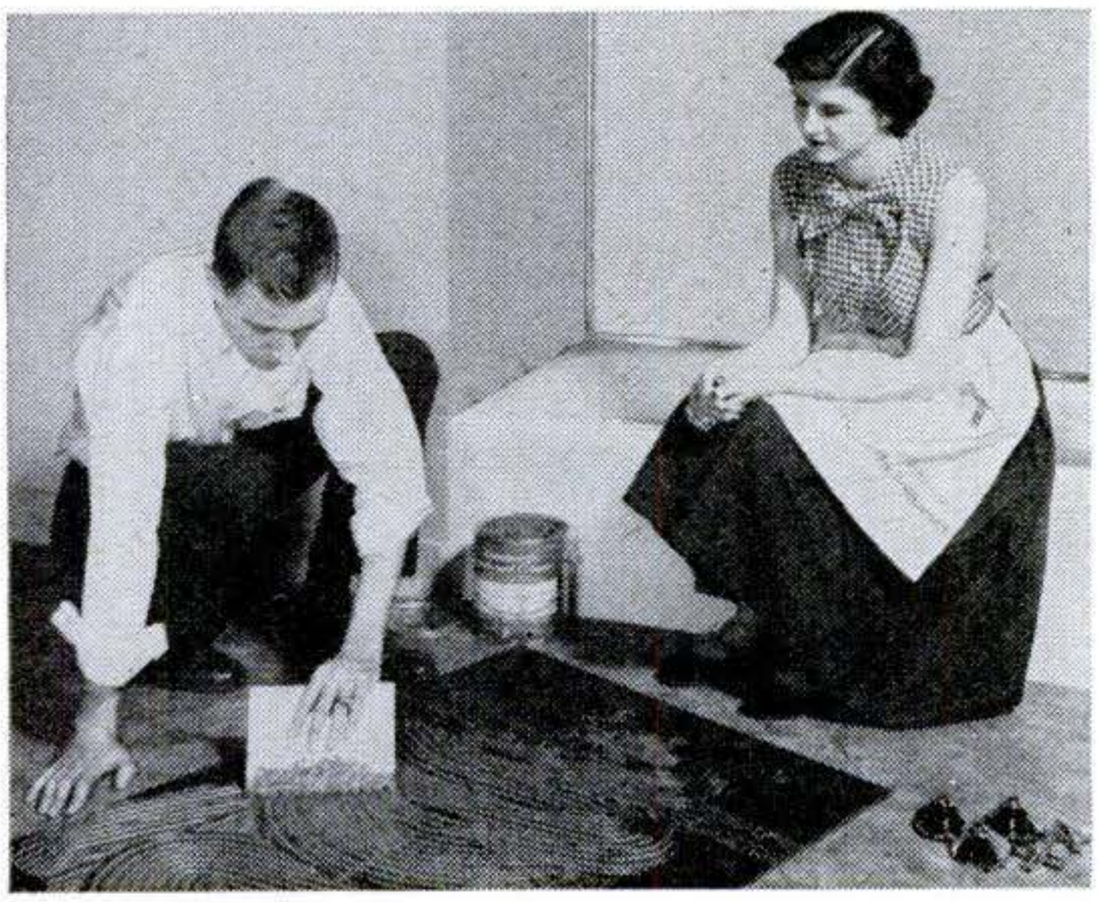
How to fix up your bathroom with Armstrong's M-67 Monowall

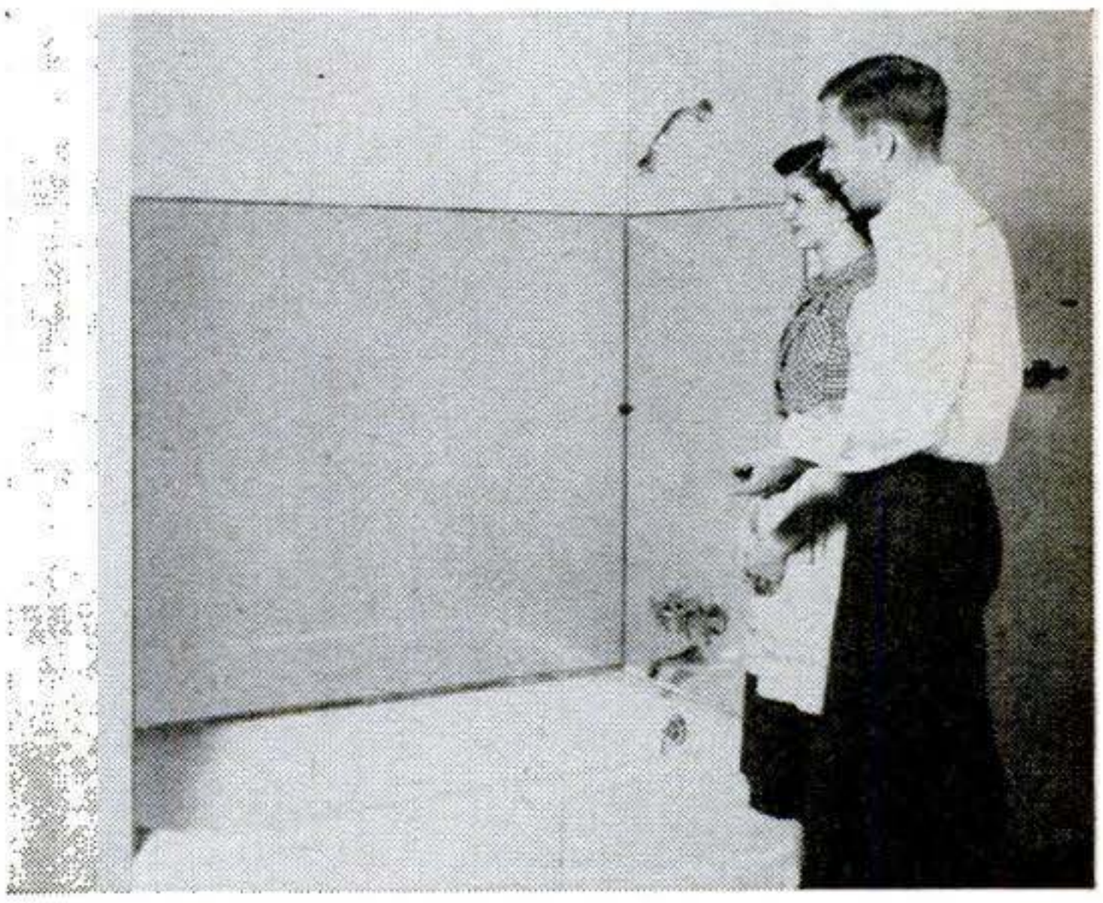
1. **Large, colorful panels** of M-67 Monowall® can help turn an old-fashioned bathroom into a bright, easy-to-clean room in less than two days. Begin by marking a level guide line around the walls.



2. **Then you cut Monowall** to fit all wall surfaces. Handy-sized sheets of Monowall cut like wood but will not crack, chip, or peel. Decorative metal channels are used for corners and joints.



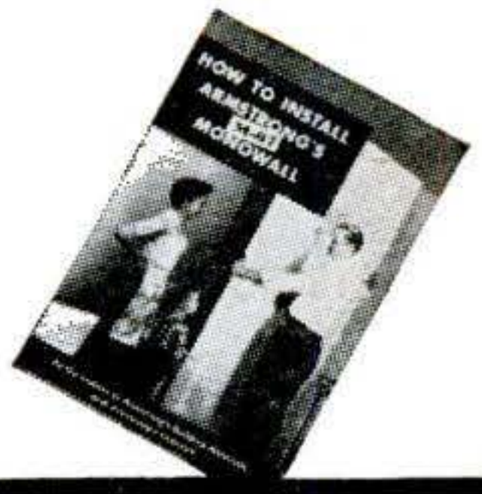
3. **Spread Armstrong's Panelboard Cement** on the back of the Monowall and apply a sealer coat to the walls. Then press Monowall into place, using metal channels to join panels.



4. **You'll be proud** of the results. Monowall's M-67 plastic finish resists all kinds of stains and hard wear, is a cinch to wipe clean. Your wife will want Monowall in the kitchen next.

M-67 Monowall's ten beautiful colors and three smart styles will suggest plenty of handsome decorating schemes for your bathroom, kitchen, or laundry. For full details, see your local building materials dealer.

FOR FREE BOOKLET: "How to Install Armstrong's M-67 Monowall," write Armstrong Cork Company, 4111 Washington Avenue, Lancaster, Pennsylvania.



ARMSTRONG'S M-67 MONOWALL

Temlok® **Cushiontone®** **Insulating Wool** **Hardboards** **Counter-top Cement**

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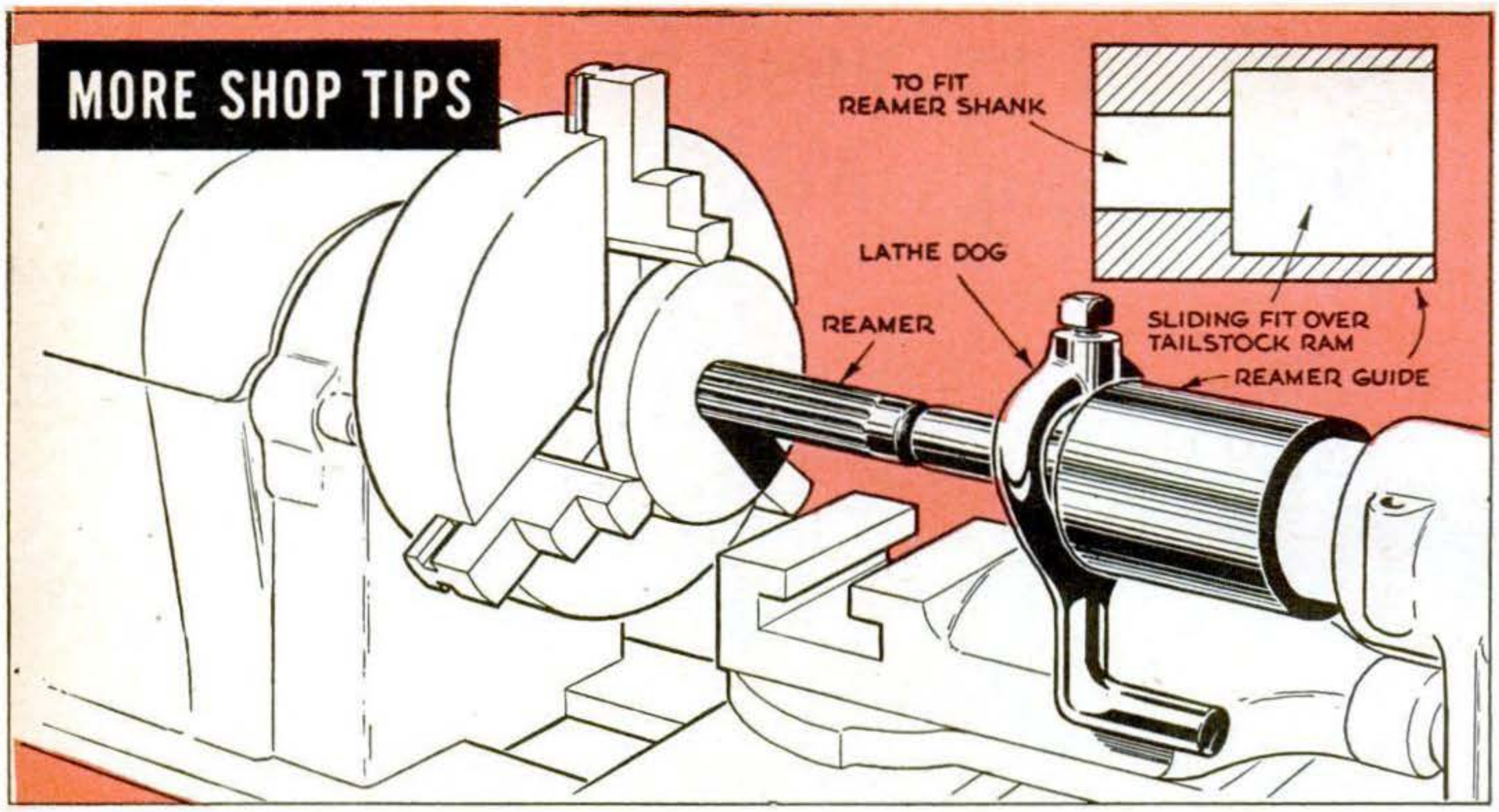
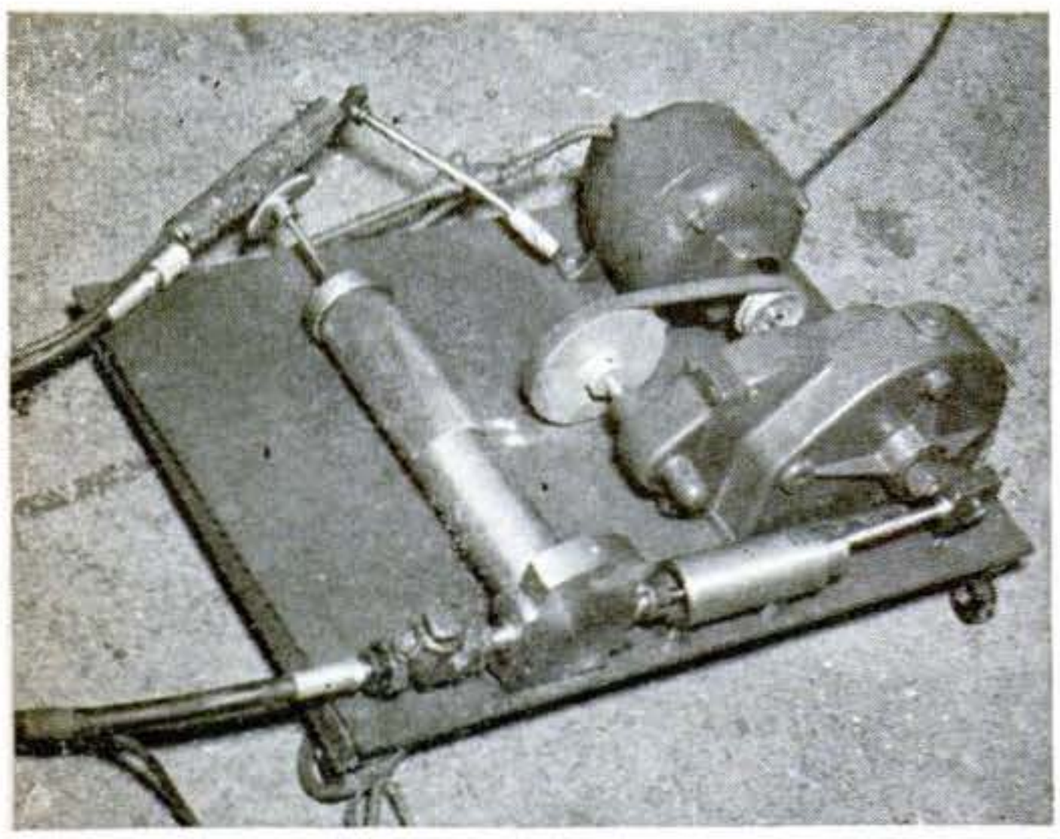
MORE SHOP TIPS

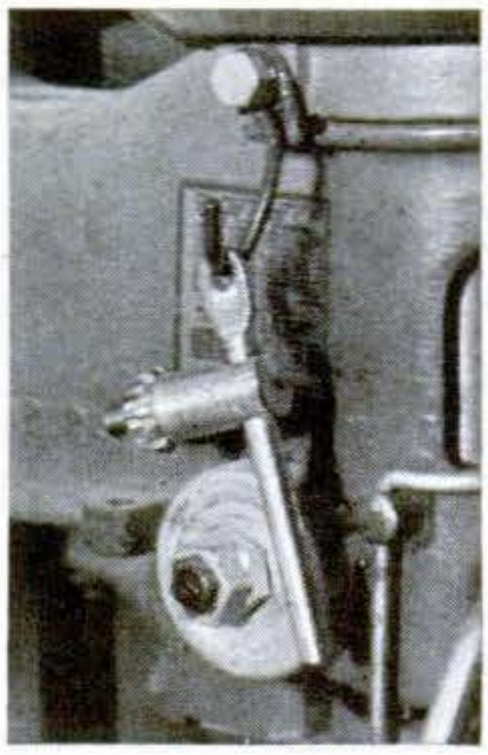


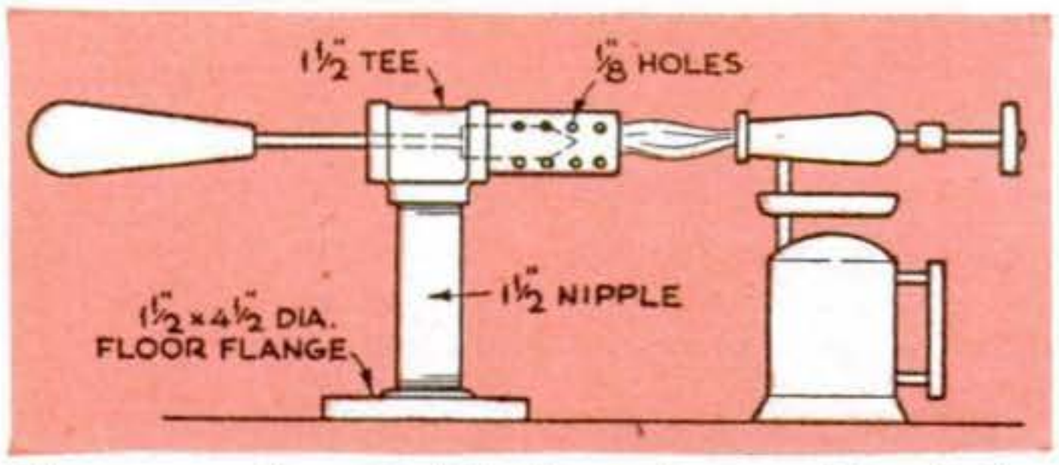
Tailstock Attachment Floats Reamers. Greatest reaming accuracy is obtained if the reamer is allowed to float in the tailstock. The reamer can be held loosely in the chuck, but the jaws seldom center themselves until turned down tightly on the work. This simple reamer guide allows the reamer to float, yet keeps it on center. The guide fits over the tailstock ram and the reamer is inserted in the hole bored in its center. A lathe dog holds the reamer against rotation.—*Joseph Tracy, NYC.*



Grease Gun Is Power-Operated. A necessity in the small, busy repair shop is this power-operated greasing outfit. A ⅜″ ram is stroked 2″ through the grease chamber by a 1″ eccentric mounted on the shaft of a gear-reduction unit. A stock grease-gun barrel mounted on the grease chamber serves as a reservoir. High-pressure hose and an insulated, heavy-duty wire run side by side to the gun. A toggle switch on the handle sets the motor in operation.—*M. R. Rice, Cranford, N. J.*

Hang That Chuck Key. That elusive drill-press chuck key will always be at hand if it is hung on a hook bent from heavy wire. The hook can be held by one of the cap screws that hold the belt guard in place.—*Gordon D. Carlson, Minneapolis.*





Furnace for Soldering Iron. Fired by a blowtorch, this furnace gets a soldering iron hot quickly even outdoors. Although portable, it is also useful on the bench.

A 1½″ pipe tee is screwed to a pipe nipple that brings it to blowtorch height. A second pipe nipple screwed into the tee has ⅛″ air holes drilled along it as shown above. The base is a standard floor flange. In use, the blowtorch flame is aimed directly into the furnace barrel.—*Lewis Booker, Louisville.*

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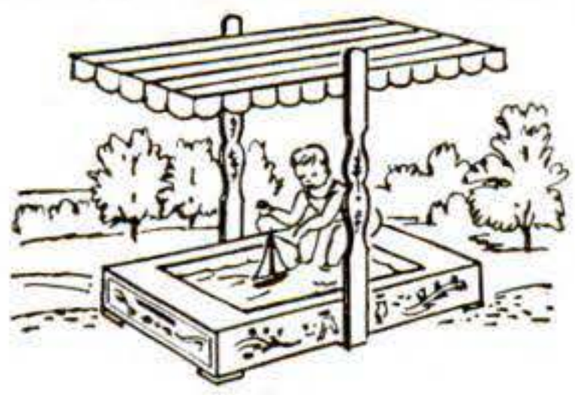
Price, $229 delivered (saw blade and custom-built motor included). Easy terms available to fit your budget. Now on sale in department stores, hardware stores, mill supply houses.

MOM wants beautiful new furniture to dress up her home!



JUNIOR AND SIS want juvenile furniture that spells play fun!

DAD wants to enjoy doing his own money-saving home repairs!

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1. **12 POWER TOOLS IN 1**—all run on *one* direct-drive motor!
2. **3-DIMENSION FLEXIBILITY**—makes it simplest and safest to learn—easiest to operate!
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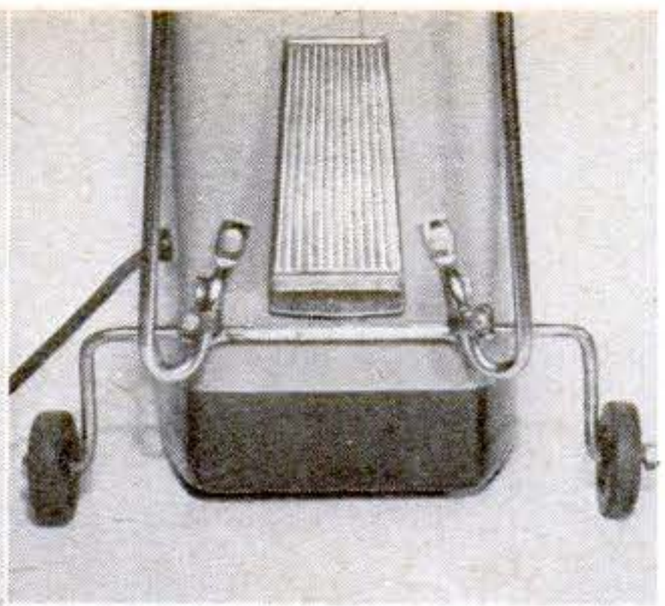
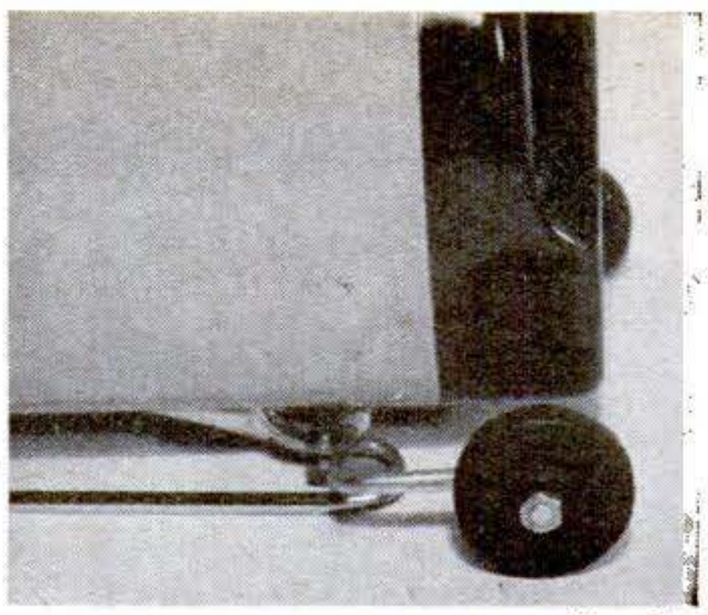
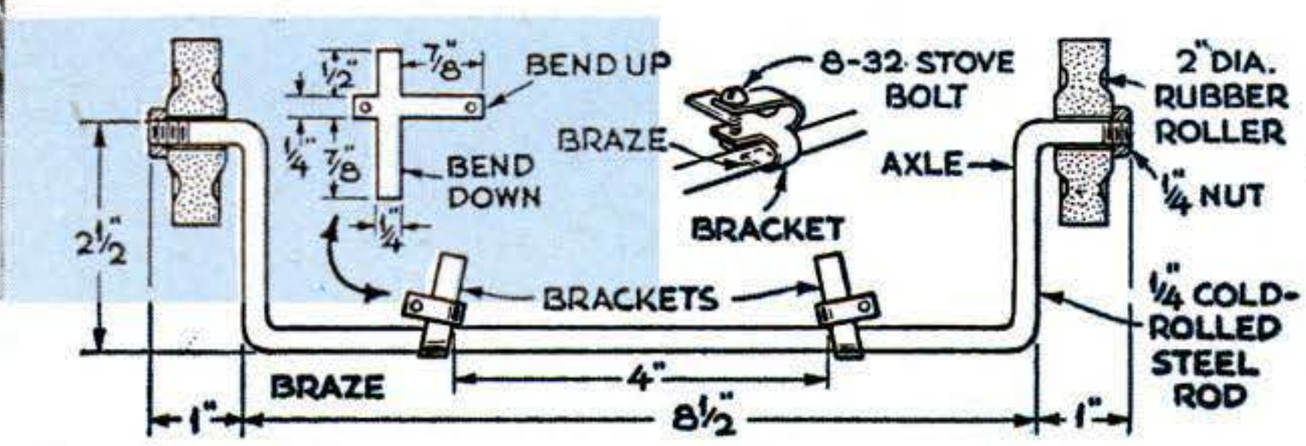
TILT CLEANER and roll it to next room—it's much easier than carrying it.



CLAMP AXLE to runners. Place brackets so weight is on wheels when tilted.



CLEANER STILL SLIDES freely on runners when in horizontal position.

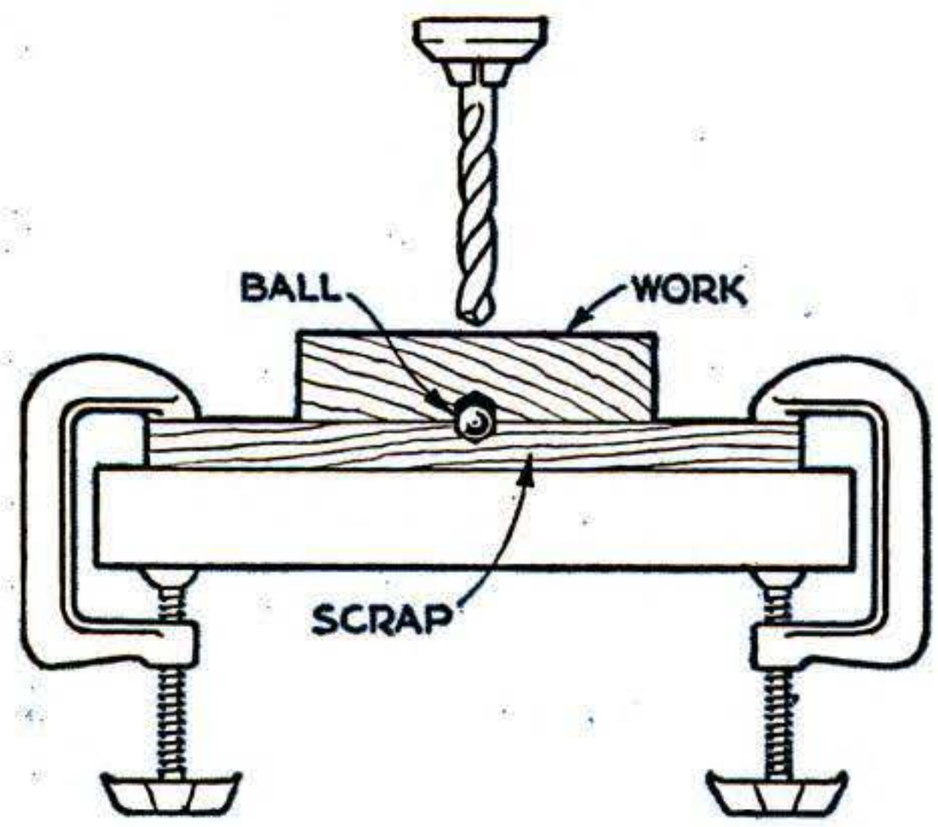


Vacuum Cleaner Mounted on Wheels Rolls to Its Work

If a vacuum cleaner is the tank type, a pair of wheels will lighten the housewife's work. The cleaner then can be rolled from room to room.

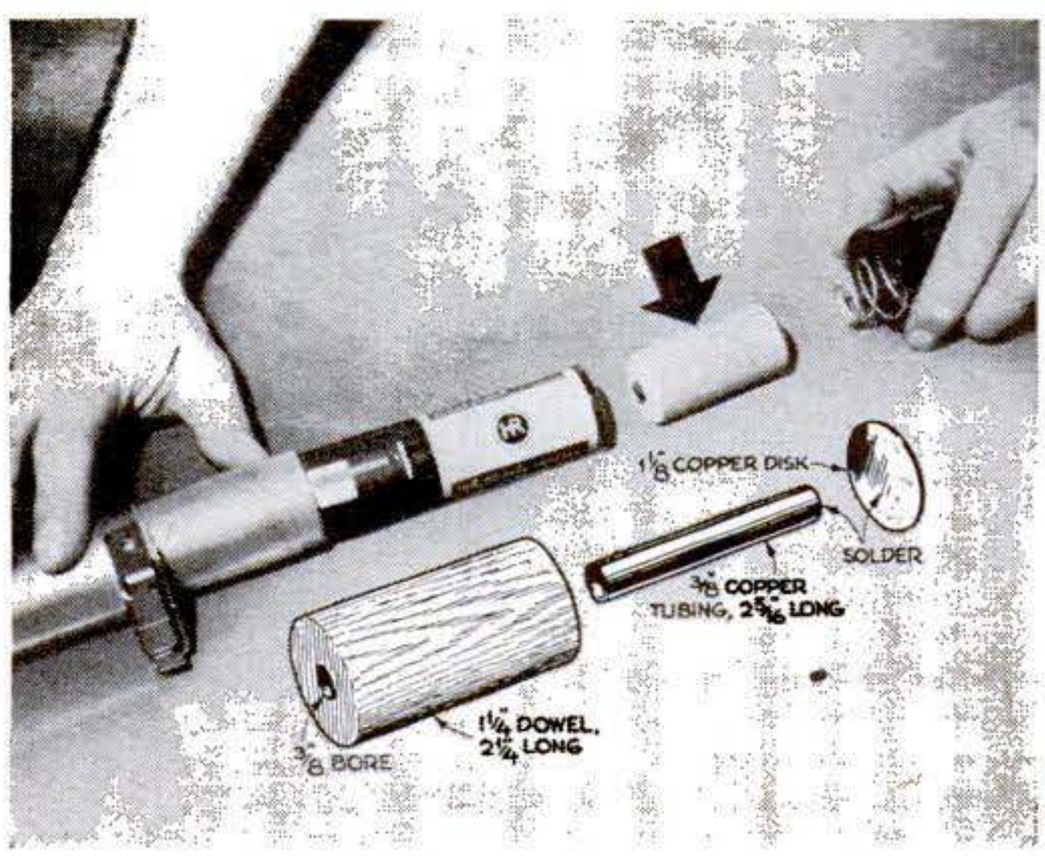
Use ¼" mild or cold-rolled steel rod for the axle. This can be shaped by clamping it in a vise and bending with a hammer to the dimensions shown. Use wheels with swivel rollers.

Cut two brackets from 1/16" mild steel to attach the axle to the cleaner. Braze the brackets to the axle 4" apart. Clamp the brackets around the tank runners with 8-32 stove bolts.—*John Rogers, Dallas.*



Preventing Splintered Holes

A bearing ball and a scrap of wood will guarantee splinterless holes in wood. Clamp the scrap to the drill-press table and drill half as deep as the drill diameter. Next drill halfway through the work. Remove it, put a tight-fitting ball in the scrap hole, invert the work and replace with the ball in the starter hole.



Dummy Cell Converts Flash Gun

Converting a three-cell flash gun to the capacitor type leaves extra space because the capacitors are only two cells long. A short dowel with a metal core fills the space and provides an electrical contact. The dummy also helps when you have only two live cells for a conventional three-cell flash gun.—*Evan Wright, Topeka, Kan.*

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Are You Gambling $500* on Your Anti-Freeze?

Yes, new improved U.S.I. PERMANENT is *the world's safest anti-freeze* — and here's why!

1 U.S.I. PERMANENT contains *more ethylene glycol* — acknowledged the world's best anti-freeze agent. Protects against freeze-ups even in coldest weather!

2 U.S.I. PERMANENT'S Special Inhibitors, a top trade secret, protect all 7 metals in a car's cooling system; stop rust, corrosion, foaming, and clogging.

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That's why the U.S.A. goes for U.S.I.! It's weatherproof, worry-free, and guaranteed! — **Get U.S.I. right after Labor Day.**

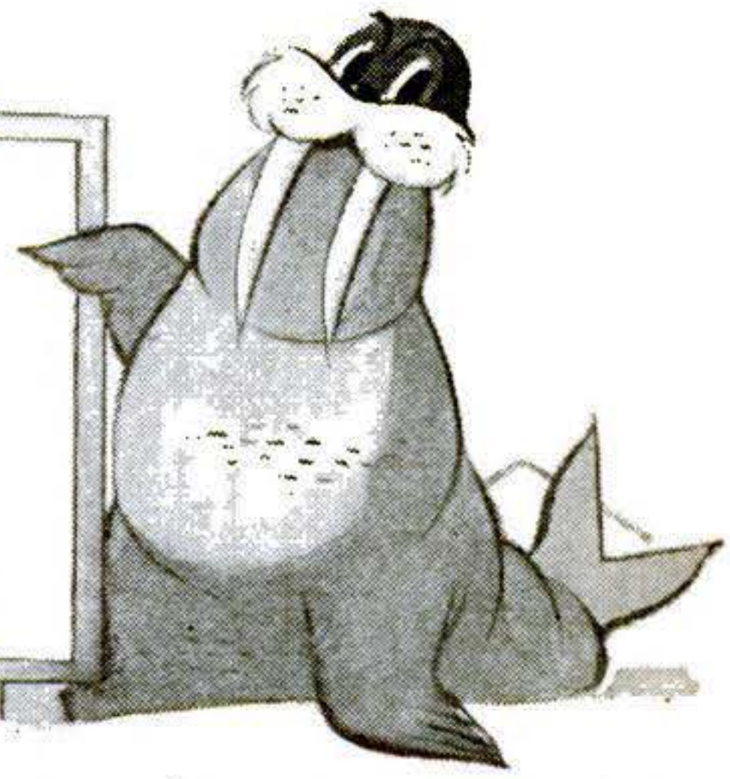
NEW, IMPROVED U.S.I. PERMANENT ANTI-FREEZE

* *$507 is the average cost of replacing engine and cooling system ruined by corrosion, in 10 leading makes of cars.*

Warning!

Don't re-use last year's anti-freeze! Any anti-freeze may become corrosive after a winter's use, and cause costly damage, say U. S. Government scientists.

(National Bureau of Standards Circular 506)



making finer anti-freezes since 1907 — U.S. INDUSTRIAL CHEMICALS COMPANY, Division of National Distillers Products Corp.

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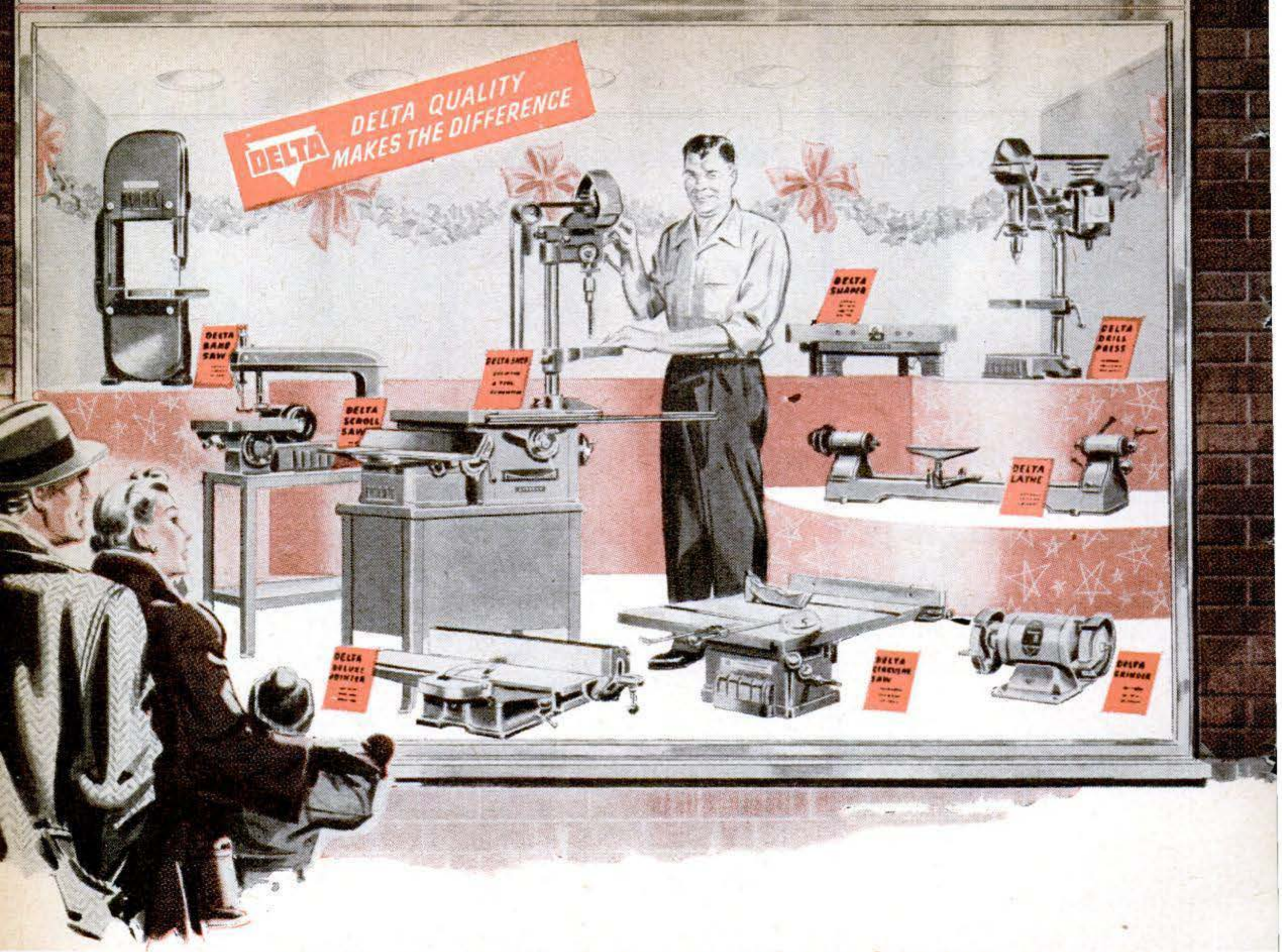
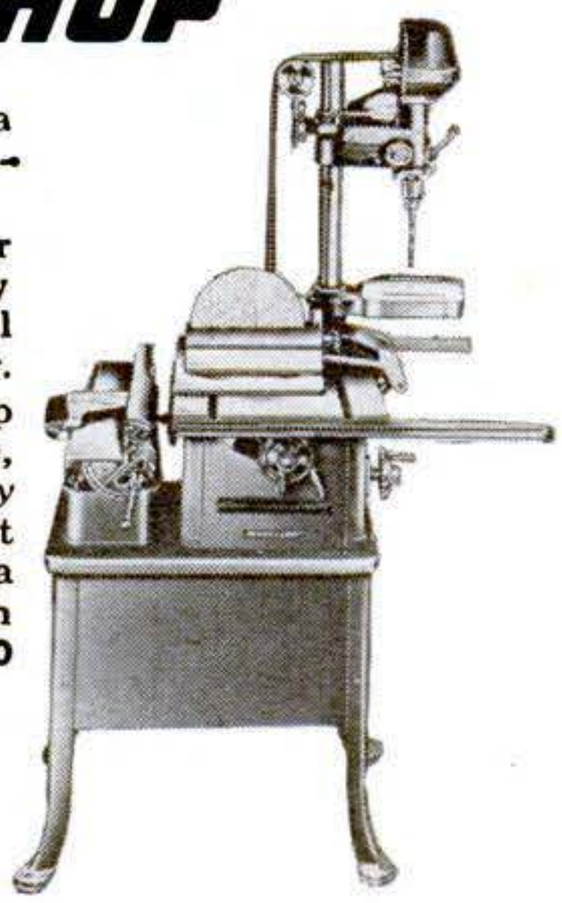


OOK FOR THIS **DELTA** *WINDOW IN YOUR TOWN*

1 DELTA SHOP



Four most basic Delta Homecraft Tools in a compact one-motor unit:

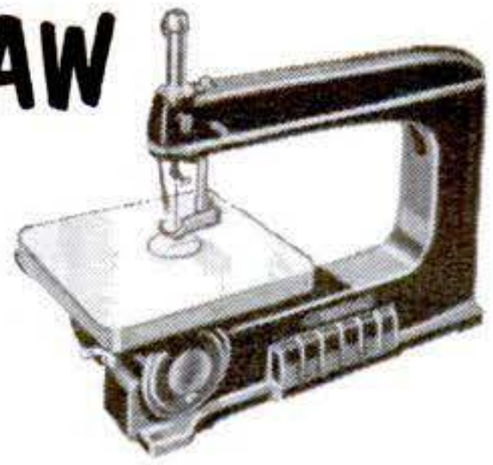
- big capacity 8″ circular saw with tilting blade; husky 4″ jointer; standard 11″ drill press; versatile disc sander.

Does 95% of all home-shop operations. Keep it anywhere, use it anywhere. All tools *ready* —no adjustment nuisance. Get it all at once or one tool at a time. Price, complete with stand—less motor . . . **$229.50** —*a low price for Delta quality.*

2 BAND SAW

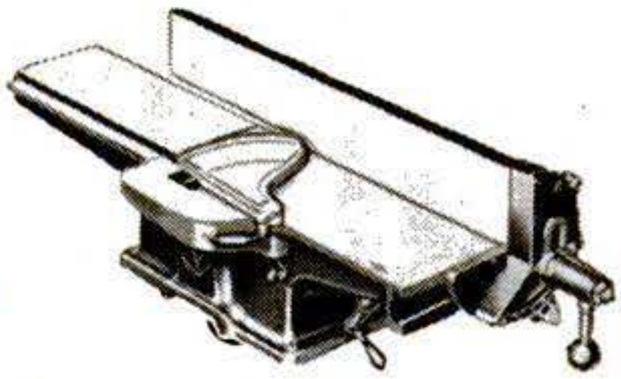
Ideal for curve cuts, inside and out; and for straight cutting of heavy stock. A natural No. 5 tool for the well equipped shop. Price . . . **$54.50** —*a low price for Delta quality.*

3 SCROLL SAW



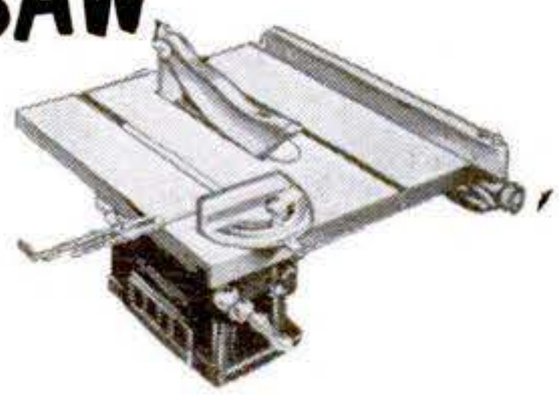
For cutting intricate patterns, fret-work; both inside and outside cuts. Youngsters love the scroll saw—safety features make it an ideal "learning tool." Price . . **$43.50** — *a low price for Delta quality.*

4 DE LUXE JOINTER



Husky precision jointer noted for safety. Puts on a perfect "finish" edge with one easy pass. Planes surfaces up to 4″ width; also does many extra jobs. Price . . . **$59.50** — *a low price for Delta quality.*

5 ECONOMY SAW



Circular saw with tilting table instead of tilting blade. Accurate saw for basic cutting at minimum cost. Price . . . **$44.50** — *a low price for Delta quality.*

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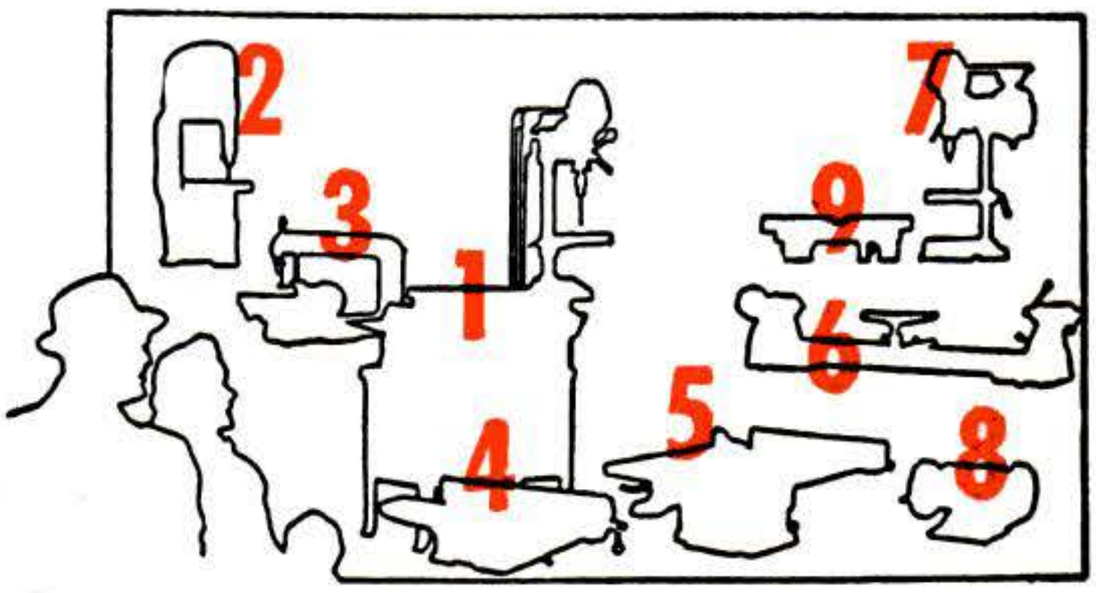
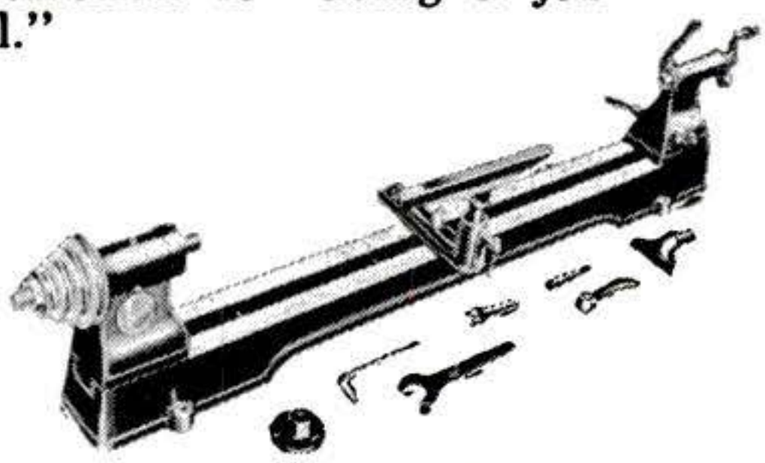
Pick Your Year-Around Gift from the DELTA POWER TOOL WINDOW

A whole lifetime of enjoyment is wrapped in every one of these famous Delta Homecraft Tools—and how well you know it! Any one of them is a welcome gift—as fine tools as money can buy, yet priced for any budget. If you're a veteran shopman, here are tools to complete your equipment, a scroll saw, drill press, jointer, lathe, grinder or shaper. Or if you've just started, there's the DELTASHOP—a one-motor combination of the four basic, most-used Delta Homecraft Tools. All have this in common—they quickly pay for themselves by cutting home maintenance and repair bills and giving you the satisfaction of "doing a job like a professional."



Most probably this very window will be shown by one or more of your local stores. It will pay you well to find it. Pick out the tools you'd like to own—then be sure to bring the family and give them your "Christmas hint" early.

6 LATHE

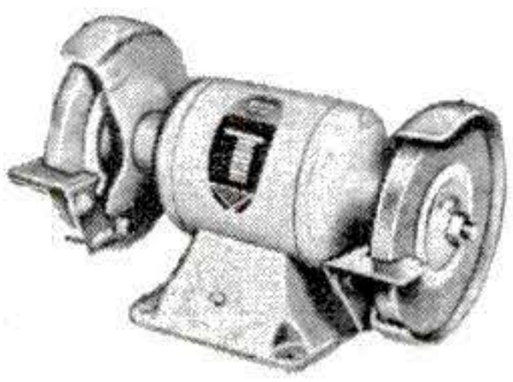


For veterans who love to make their own designs, then turn them. No finer tool than this Delta Homecraft 11″ Lathe. Price . . **$64.50**—*a low price for Delta quality.*

7 DRILL PRESS

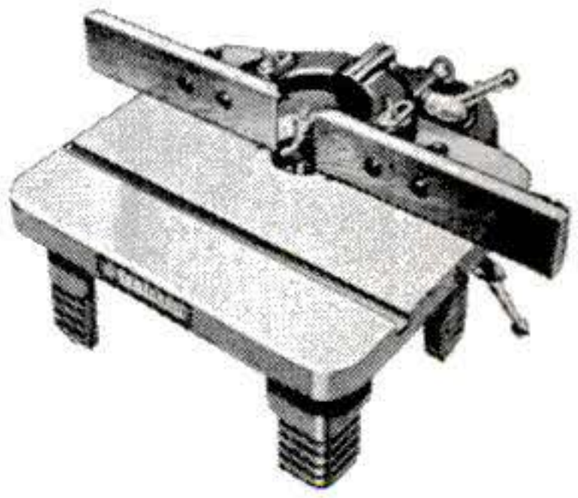
Rugged, accurate "must" for every shop; the most-used tool—can be used to drill, route mortise, carve, many more. With Delta accessories, its usefulness is almost unlimited. Price . . . **$54.50**—*a low price for Delta quality.*

8 GRINDER



This carefully engineered bench grinder keeps cutting tools sharp and bright. Can also be used to clean and buff. A real time and money saver in the workshop. Price . . . **$39.95**—*a low price for Delta quality.*

9 SHAPER



Make cope and reverse mouldings—sash, door and brick mouldings, base moulds, ornamental edges; a wanted tool for post-grad shopmen. Price . . . **$69.50**—*a low price for Delta quality.*

Delta dealers are listed under "Tools" or "Machinery" in the yellow pages of your phone book. You can also buy Delta Homecraft tools from leading department stores and IRHA hardware stores in your city. *Delta Power Tool Division, Rockwell Manufacturing Company, 504M N. Lexington Avenue, Pittsburgh 8, Pa.*

Prices slightly higher west of the Rockies

DELTA QUALITY POWER TOOLS

Another Product of **Rockwell**

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Plywood Back Rest Turns Bed into Sofa

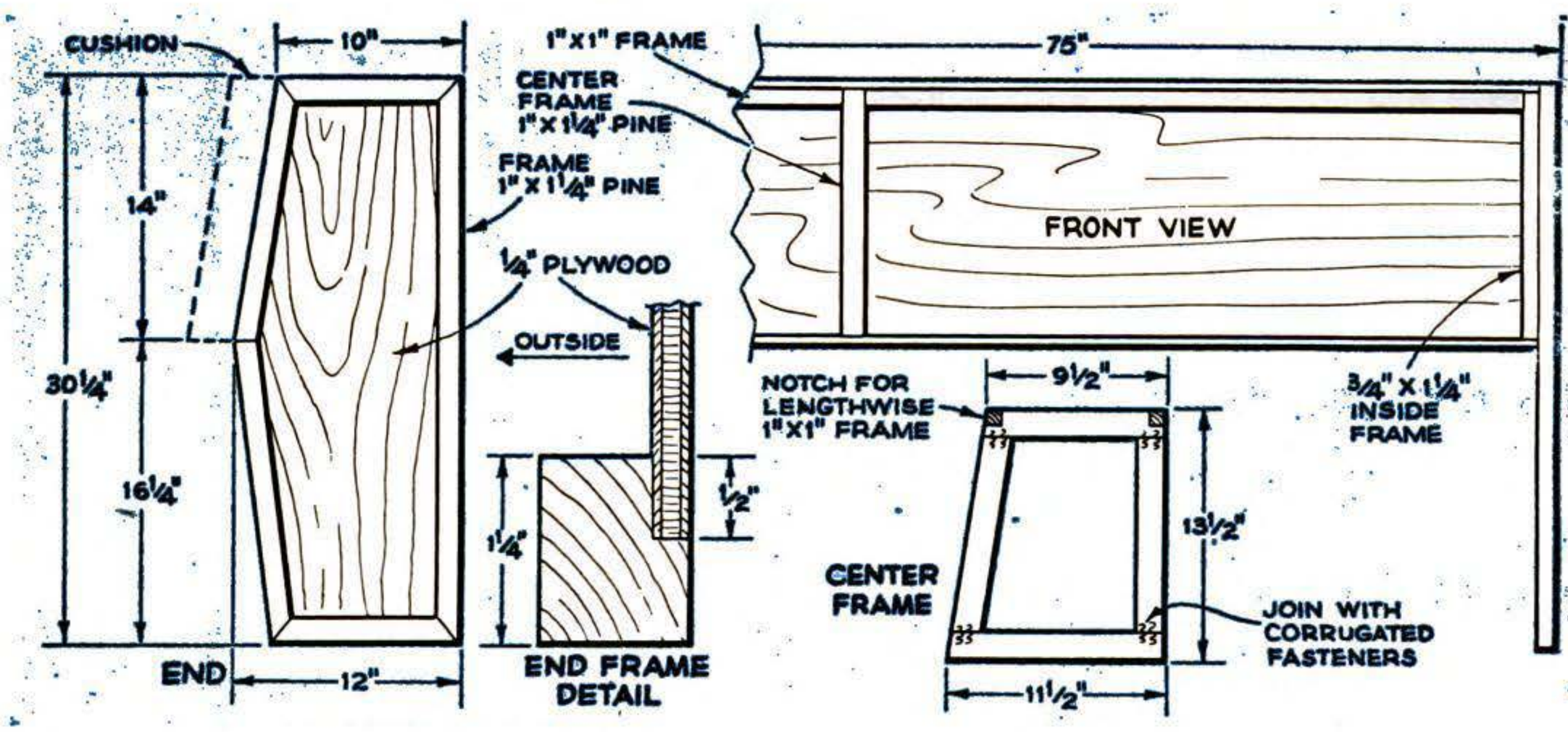
Easy to build, it makes it simple to turn a living room into a bedroom.

YOU can use this sofa bed 24 hours a day. The idea was borrowed from modern hotels that give patrons both a sofa and a bed in a small room. The unit consists only of a frameless bed and a plywood back rest that also stores bedding.

A child's room where play space is at a premium or a den that doubles as a guest room are ideal spots for the two-way units. A pair built around twin beds will convert a master bedroom into a pleasant daytime sitting room.

The back-rest dimensions are for a standard single bed about 16″ high and 6′ long. However, you can use a bed of any size. Just build the back rest about 1″ longer and ½″ higher than the bed to allow it to slide under.

The framing is pine, 1″ by 1¼″ for the ends and center frame, ¾″ by 1¼″ for the two inside end frames and 1″ by 1″ for the longitudinal members at the two top corners. The back and front are butted against the bottom without lengthwise framing. Attach the plywood to the frame with glue and finishing nails. The end panels are rabbeted into the frame pieces.—*John Rogers.*



Sliding-Door Cabinet Increases Bathroom Storage Space

TEMPERED hardboard is used for the sliding doors of this medicine chest. Grooves can be made with a dado cutter or by running 1″-by-5″ pine over a power-saw blade twice to make a wide kerf. Miter the corners of the pine box and join with glue and nails.

Insert the doors before assembling the cabinet. Rub soap or paraffin in the grooves to keep the doors sliding smoothly.—*W. A. Van Sandt, Norfolk, Va.*

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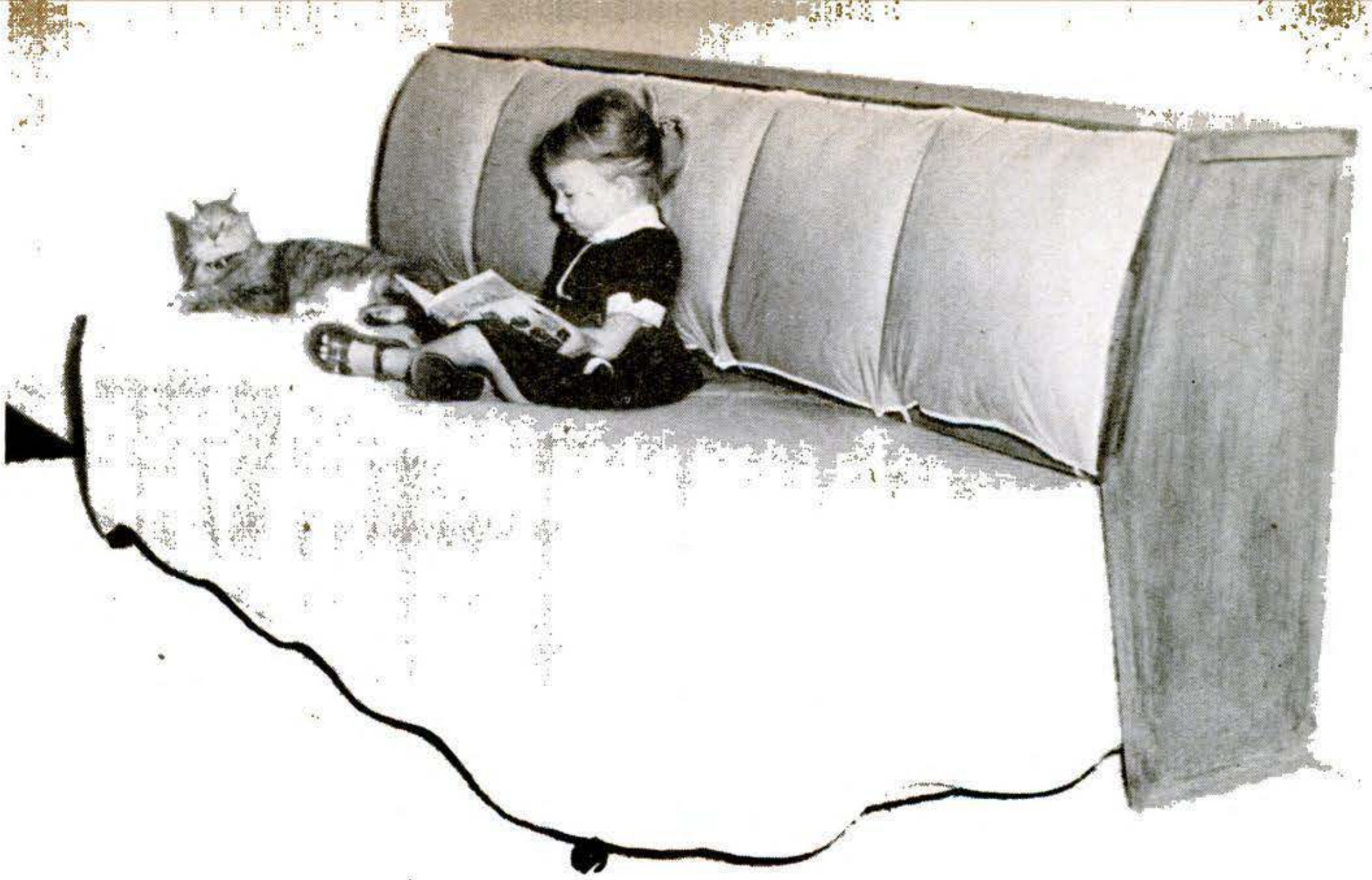
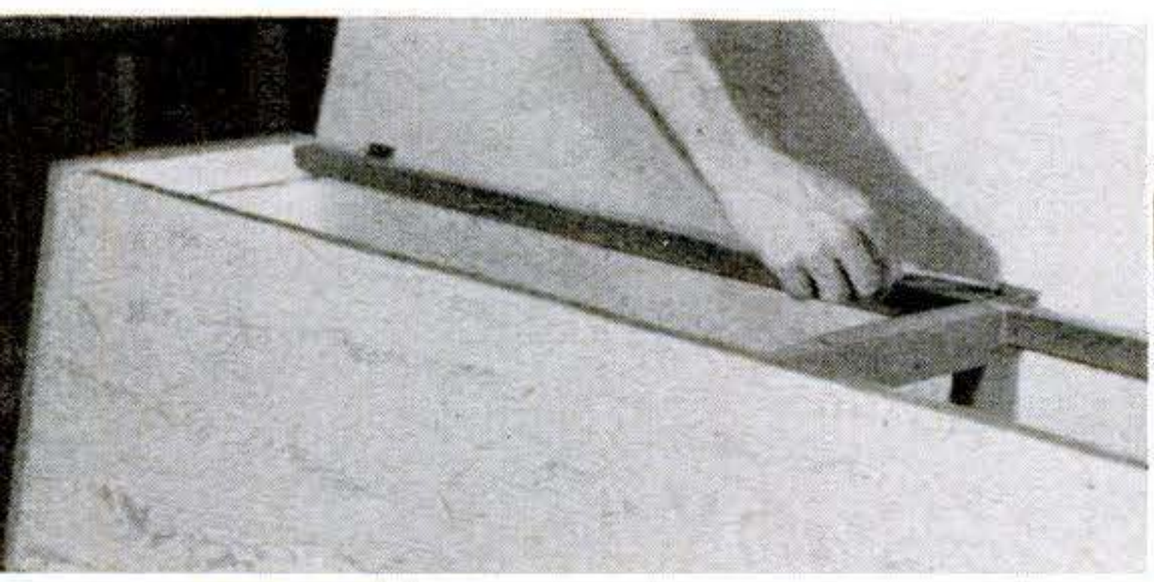
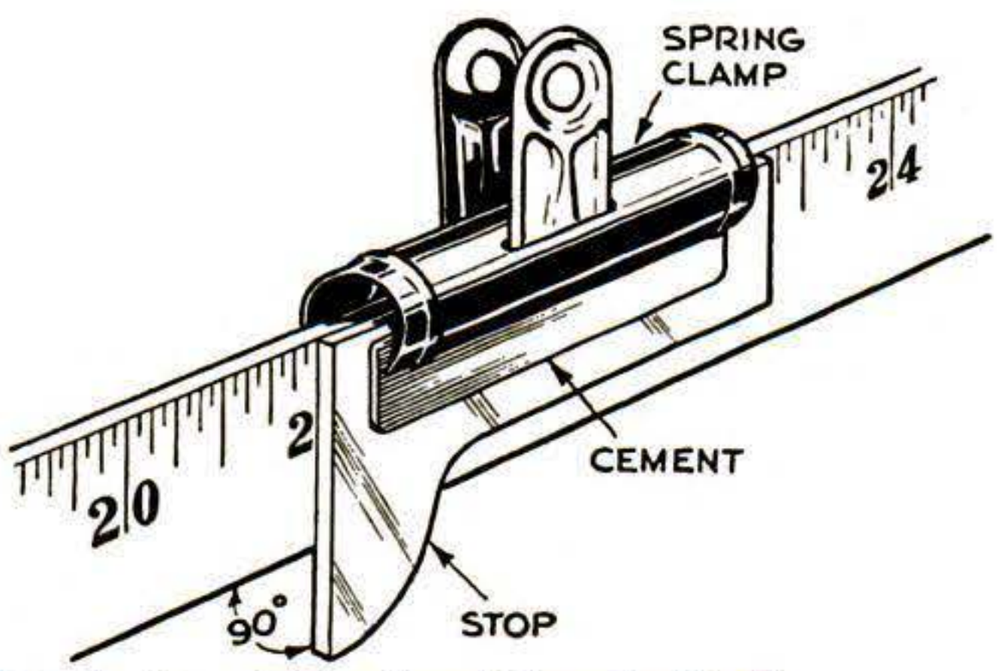


DURING DAY, bed is partly hidden under back rest. Bed can be old one with head and foot removed or springs fitted with clamp-on legs.



TOP LIFTS UP to store bedding, is fastened on with three brass butt hinges. Top, sides, bottom and ends are ¼" plywood.

AT NIGHT, bed is pulled out like this. Back rest is padded with sailcloth cushions that are tacked on.

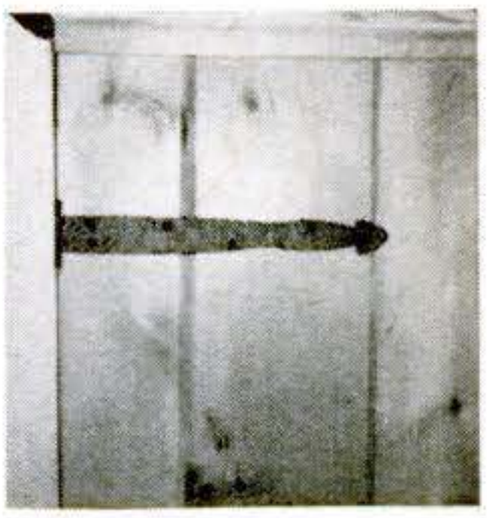


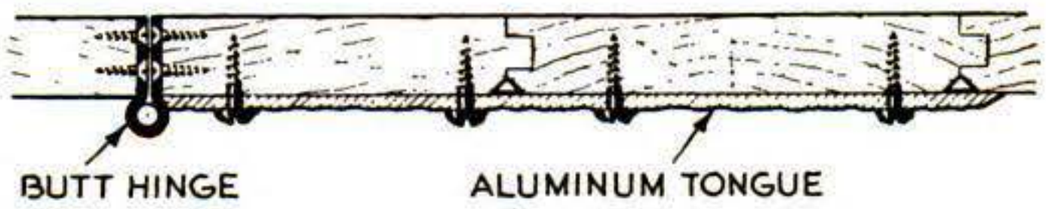
Pointer Marks Yardstick

A SLIDING stop on your yardstick will make measuring easier. Cut the pointer out of aluminum, plastic or thin plywood and clip it on with a spring-type paper clamp. —*Walter E. Burton, Akron, Ohio.*

Dummy Hinges Look Real

You can make convincing copies of wrought-iron hinges by combining dummy tongues with butt hinges. Cut tongues out of heavy sheet aluminum, peen surface with ball hammer and fasten with roundhead screws. File facets on screwheads for hand-wrought look. Paint hinges black.—*G. A. Devan, Missoula, Mont.*





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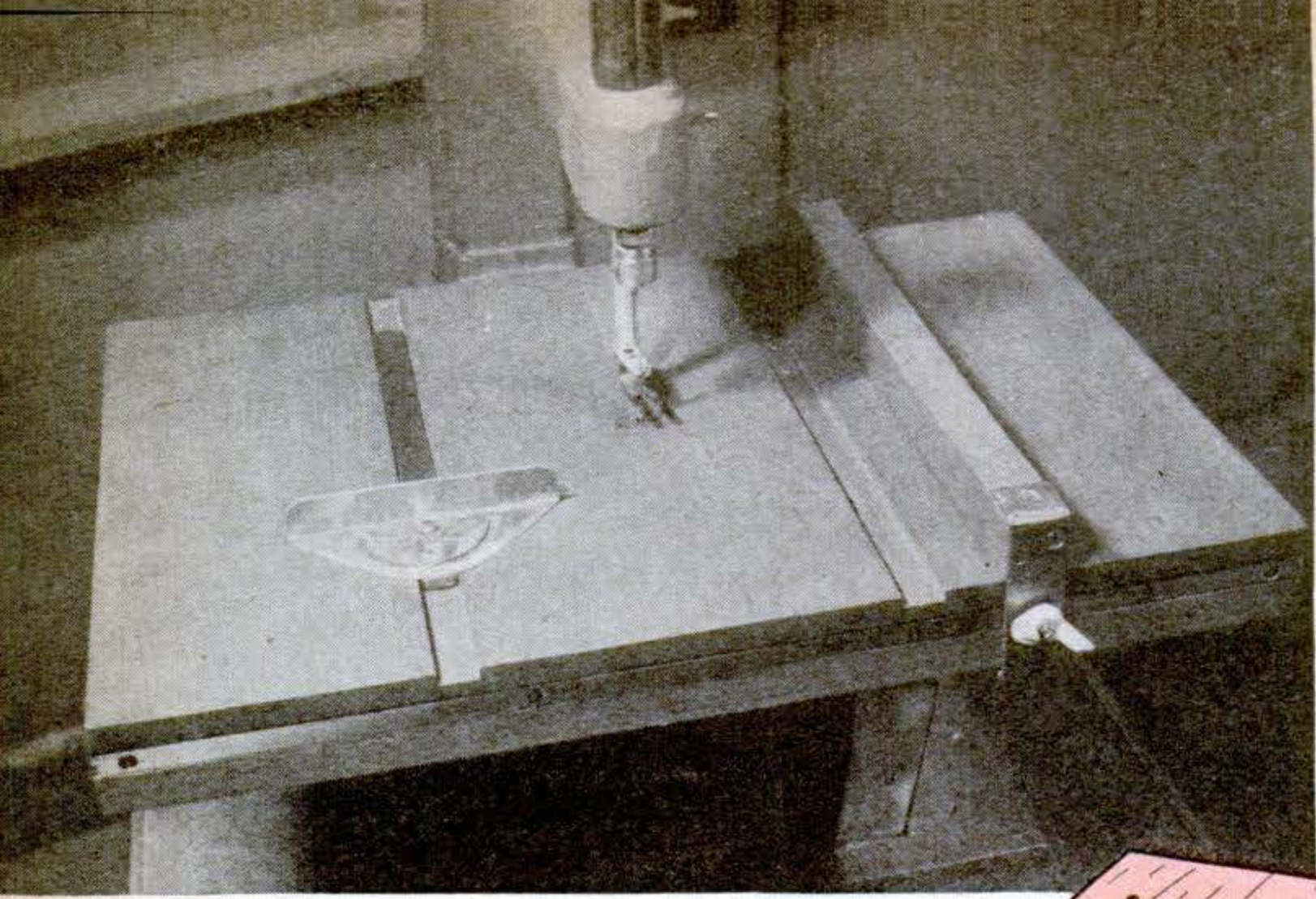

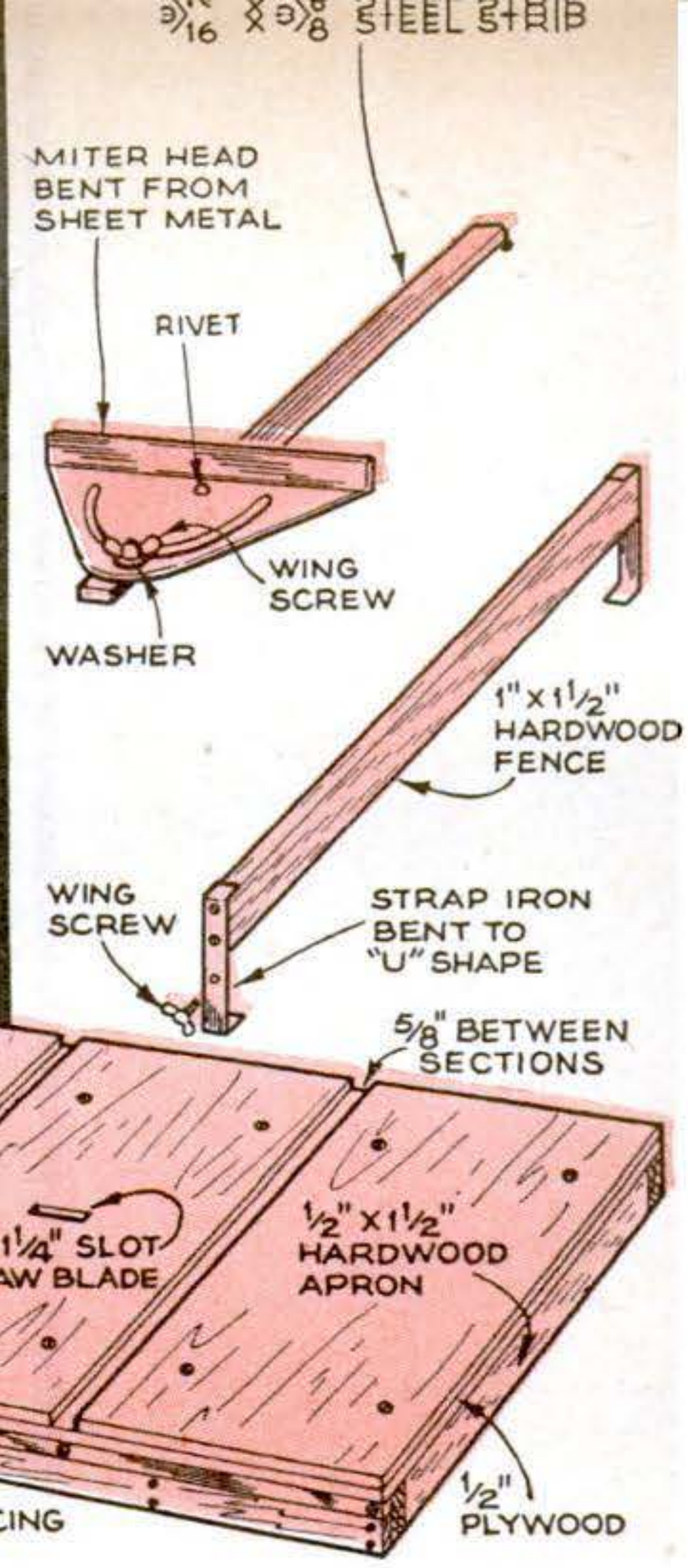

Extra Table Boosts Jigsaw Use

IF YOU lack a circular saw, an auxiliary table fitted to a jigsaw will enable you to make straight-line, angle and bevel cuts.

Make grooves for the miter gauge by screwing three pieces of 3/16″ plywood over a panel of ½″ plywood 20″ long and 1″ wider than the depth of the jigsaw table. Use a steel strip ⅝″ wide for setting the spacing between the three pieces. Use the same strip for the body of the miter gauge.

Screw a ½″-by-1½″ hardwood apron around the underside of table. Add two more crosswise strips underneath to fit snugly against the ends of the jigsaw table, and place two turn buttons on these to keep table from lifting. The elongated saw-blade slot permits tilting table for bevel cuts.

Make the fence from 1″-by-1½″ hardwood and two U-shaped ends bent from heavy strap iron to fit snugly under the front and back aprons. Drill and tap the front bracket for a ⅜″-16 wing screw to lock the fence against a ⅝″-by-3/16″ steel strip set in the front apron. If you can't buy a screw of this type, make one by threading a wing nut on a machine screw and pinning or soldering it in place.

Bend the miter head from 3/32″ sheet metal and cut a semicircular slot at about a 1″ radius off the pivot hole. Fasten the head to the steel strip with a rivet, countersunk and filed flush on the underside. Drill and tap the strip in line with the slot in the head for a ⅜″-16 wing screw. Calibrate gauge for quick-setting to the most-used angles.—*Will Thomas, Buffalo.*

Water Keeps Putty Pliable

WHEN you have a blob of putty left over after a job, place it in a glass or other handy receptacle. Cover with water, and the putty will stay pliable for an indefinite period of time.—*O. A. Nelson, Seattle.*

Flash Extension Can't Slip

YOUR extension holder won't slip and droop with this extra spring to help tighten it. Cut the feet off an old spring clamp, bend the ends to form hooks, and wedge the spring between the clamp arms.

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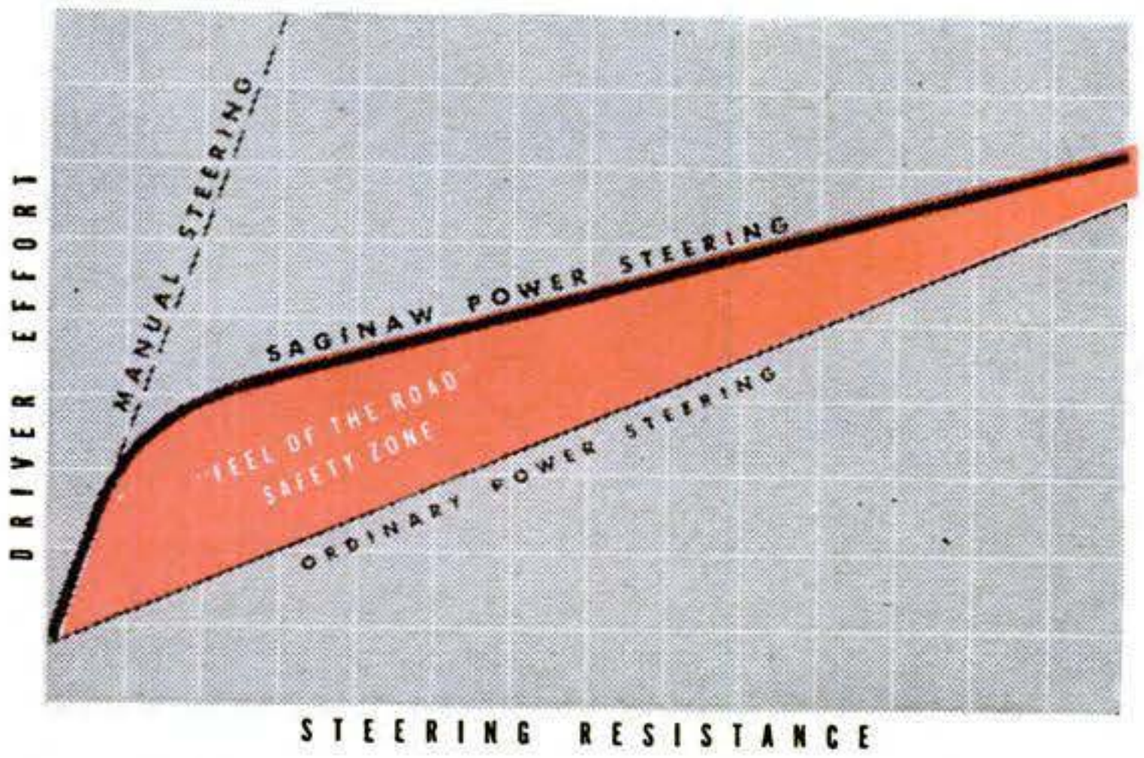
Number Two of a Series

What every Automobile man should know about Power Steering

POWER STEERING is attracting more attention in the automotive field, and winning more rapid public acceptance, than anything since automatic transmission. Saginaw Power Steering is now available on all General Motors cars and three other well-known makes. Already over *half a million* new-car owners are enjoying it—yet, as with any new product, there are still some misconceptions due to incomplete or faulty information. That's why we, as the world's largest producer of power and manual steering gears, are publishing this series of messages to help answer some of the questions most frequently asked about Power Steering.

4. WHY IS "FEEL OF THE ROAD" SO IMPORTANT TO POWER STEERING SAFETY? Without this familiar "feel" in the steering wheel, many drivers have a sense of insecurity and a tendency to oversteer. In other words, *when power is applied continuously, steering is frequently too easy for safety.* So we have deliberately designed Saginaw Power Steering to go to work *only when you need it.* Whenever mere "fingertip" effort is needed to steer (as at high speeds on a smooth, straight highway) your car remains under conventional manual control. But, the moment *more* than "fingertip" effort is called for, Saginaw Power Steering instantly supplies the additional "muscle"—with just enough effort left to the driver to assure the normal "feel of the road"—as graphically shown in the chart. With Saginaw Power Steering there is never any sensation of "driving on ice." *It never interferes with safe control of your car.*



This simplified graph shows the basic difference between Saginaw Power Steering and ordinary types. The latter apply power at the slightest touch of the wheel, tending to cause overcontrol. Saginaw Power Steering goes into action only when more than "fingertip" pull is needed. This SAFETY ZONE is purposely provided to assure normal "feel of the road" and prevent oversteering.

5. MUST DRIVERS BECOME ACCUSTOMED TO POWER STEERING? Not *Saginaw* Power Steering! There's nothing new to learn because your wheel still has that reassuring "feel of the road" at all times. *You cannot feel Saginaw Power Steering "cut in" or "cut out."* The only difference you notice is the effortless ease of turning . . . the wonderful freedom from "wheel fight." After a turn, your car straightens out exactly as with manual steering.

The simple, ingenious Saginaw design which accomplishes all this so dependably will be the subject of our next message.

MEANWHILE—if you'd like to learn more, we'll be delighted to send you "THE *FACTS* ABOUT POWER STEERING"—an interesting booklet we've prepared to help give you a better understanding of this important new development. It's yours for the asking—just use the handy coupon.

Saginaw

POWER STEERING

Saginaw Steering Gear Division
General Motors Corporation
Saginaw, Michigan (Dept. S)

Please send a free copy of "The *Facts* About Power Steering."

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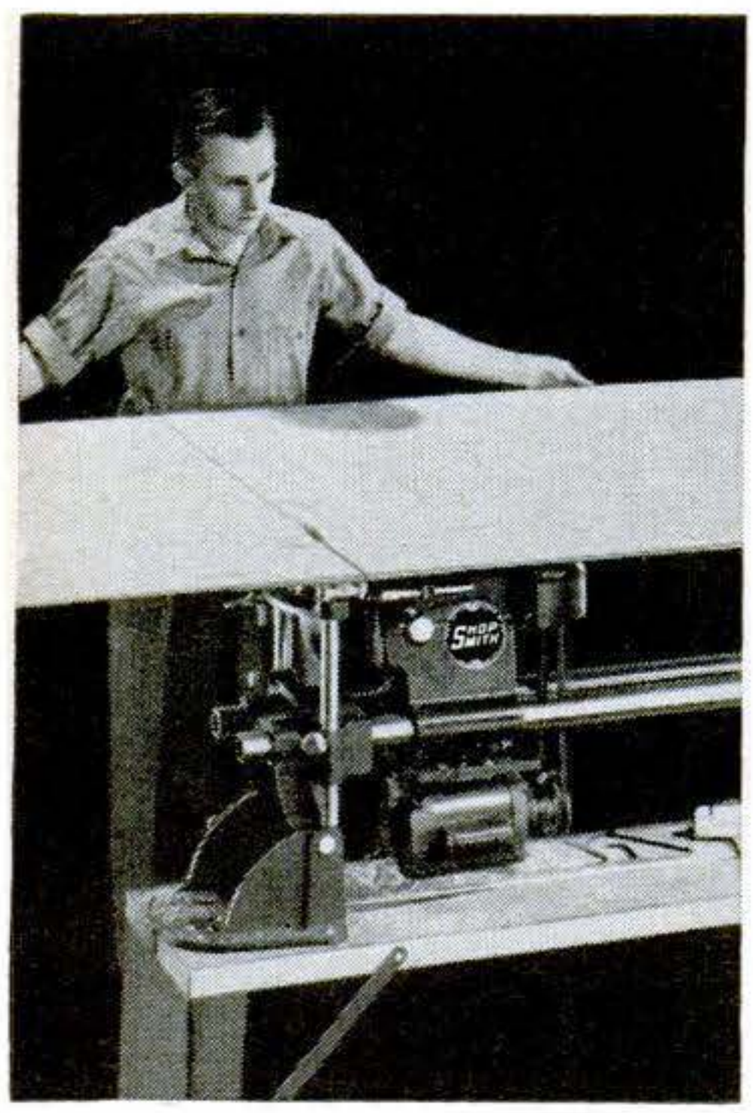
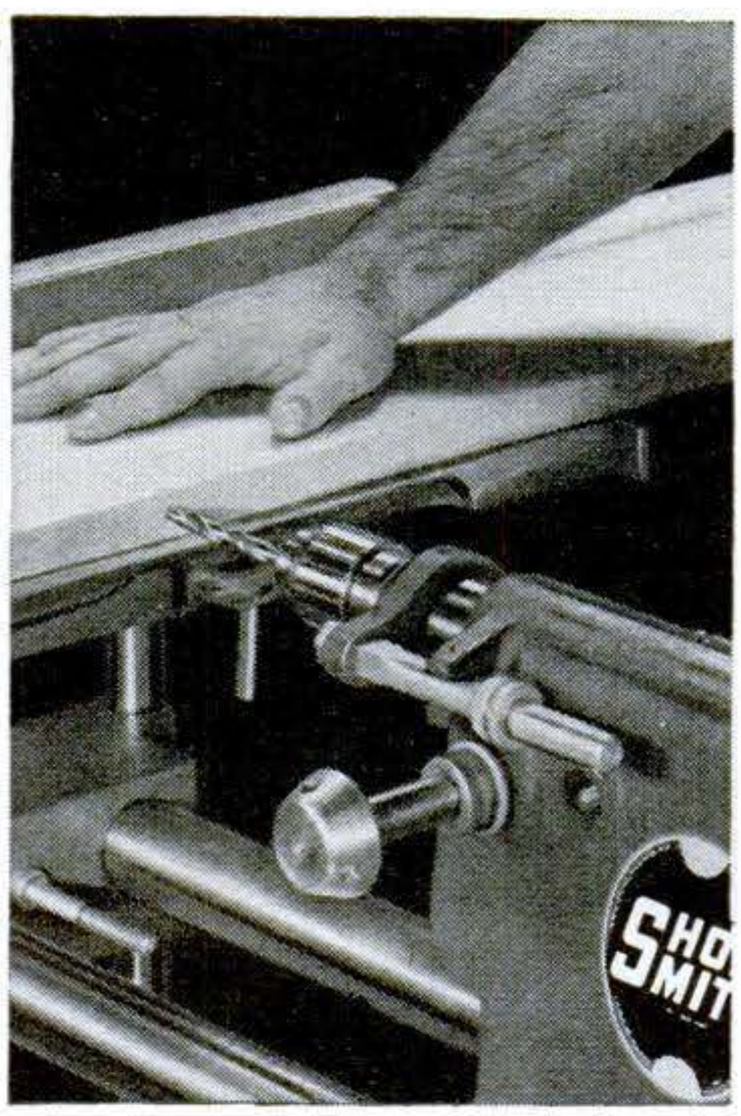
PROVE TO YOURSELF

WHICH POWER TOOL

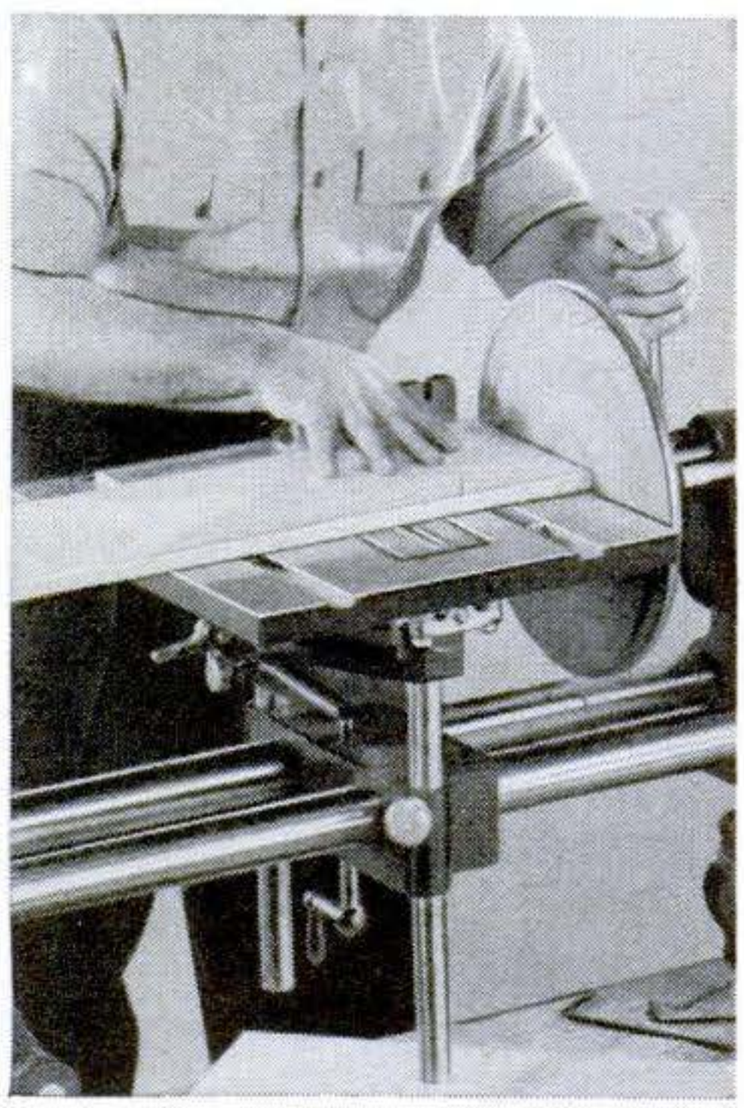
How can you do it? Easy—*get a demonstration. Not only of SHOPSMITH, but of other leading makes, too. It's the only**



COMPARE CAPACITY Notice that SHOPSMITH's 8″ Circular Saw can rip 8′ panels into two identical 4′ sections. What other saw can do this? And what other drill press can drill to the center of a 15″ circle? What other lathe has a 15″ swing? What sander has unlimited capacity?



COMPARE ACCURACY Precision is *built into* every part of every SHOPSMITH. But don't take our word for it — see how the Horizontal Drill Press, for example, dowels large flat pieces *with absolute accuracy*. Notice, too, SHOPSMITH's method for setting the saw blade right to a hairline.



COMPARE VERSATILITY SHOPSMITH is the five most-used big tools in one compact unit—an 8″ Circular Saw, a 12″ Disc Sander, a 33″ Lathe, a Vertical and a Horizontal Drill Press. When you get SHOPSMITH, you get exactly the tool you need for every job you want to do. No special jigging.

HAVE YOU READ THE NEW McGRAW-HILL WOODWORKING BOOK? It's the most complete power woodworking book ever published! *Power Tool Woodworking for Everyone* has 283 pages of valuable information and 560 photographs and drawings. Only $4.95 at book stores and where SHOPSMITH is sold.

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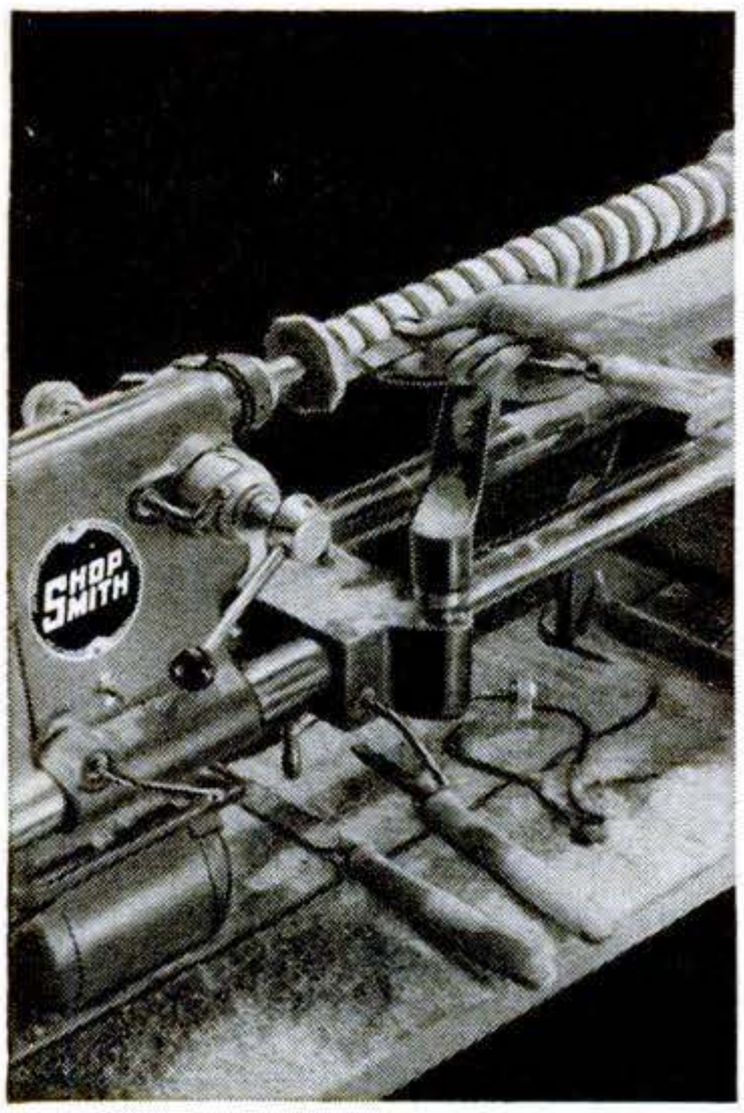
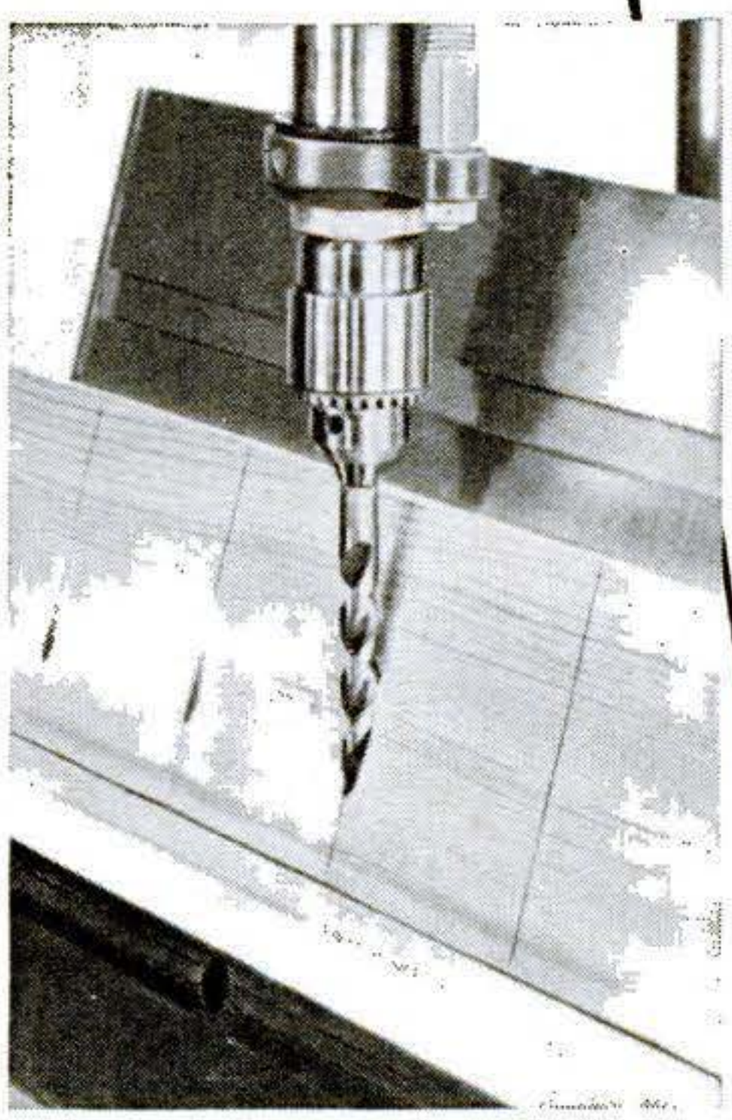
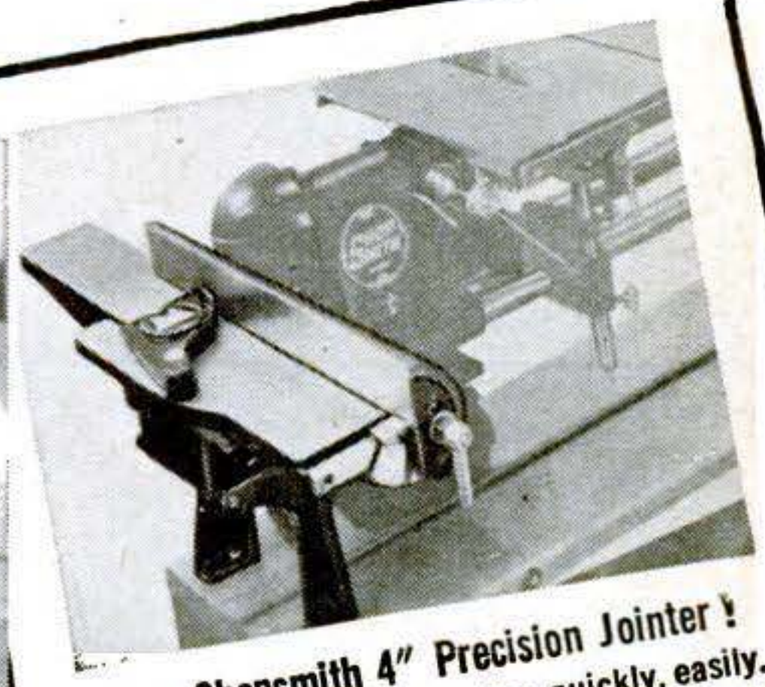
IS BEST FOR YOU

fair, convincing way to pick a power tool. Here are a few points to keep in mind when you get your demonstration:







New Shopsmith 4" Precision Jointer! Extra-long 28" table. Attaches quickly, easily. Can be operated simultaneously with saw as conventional saw-jointer combination. Three-knife cutter head runs on grease-sealed ball bearings. Unique Allen-wrench knife adjustment is easiest method ever devised for jointer knife adjustment. Fence tilts 45°-45°; automatic stops. Width of cut 4"; depth of rabbet, 5/16". Only **$44.95** (mounting kit, **$9.95**).

COMPARE EASE OF OPERATION Lathe's sliding *headstock* puts work within easy reach, allows you to *face* work. Swiveling tool rest slides parallel to piece being turned, eliminates need to reset constantly. Single belt and pulley facilitate speed and tool changes. Makes hard jobs easy.

COMPARE CHANGE-OVER TIME And don't take claims for facts—not even ours. For example, see for yourself how you can change SHOPSMITH from a Saw, Horizontal Drill, Disc Sander or Lathe, into a Vertical Drill Press in less than 60 seconds! Note quick accessory attachments, too.

COMPLETE 5-TOOL UNIT

***ONLY* $199.50**

Motor** and bench ends extra

Chrome rust-proofing now standard on all SHOPSMITHS.

Special heavy-duty SHOPSMITH ball-bearing motors: ½ h.p., **$34.50; ¾ h.p., **$44.50**

*See America's fastest-selling power tool at leading hardware and department stores, or at Montgomery Ward. Stop in for an on-the-job demonstration. **Prove to yourself SHOPSMITH is the best power tool for you.**

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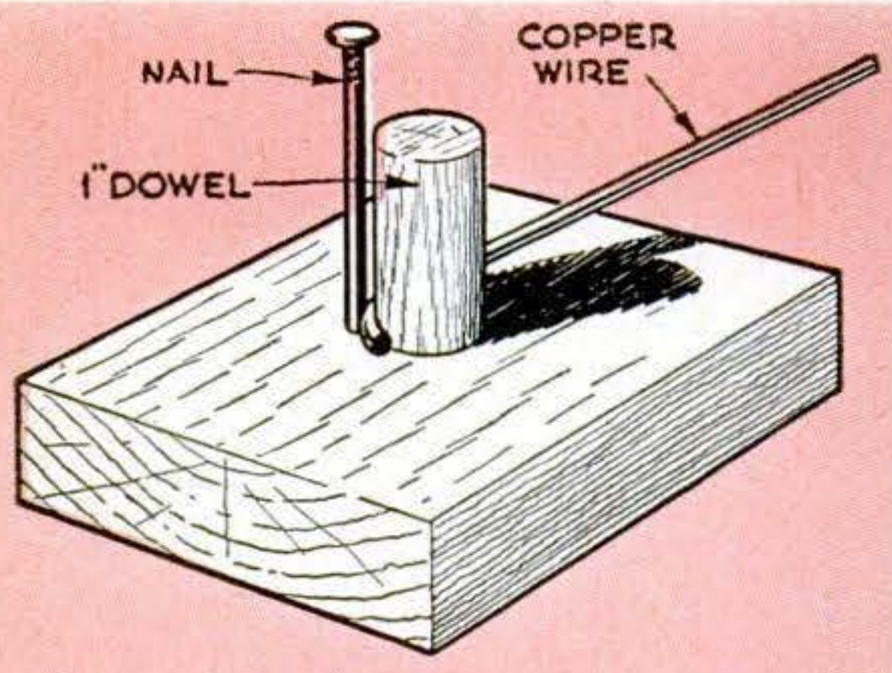
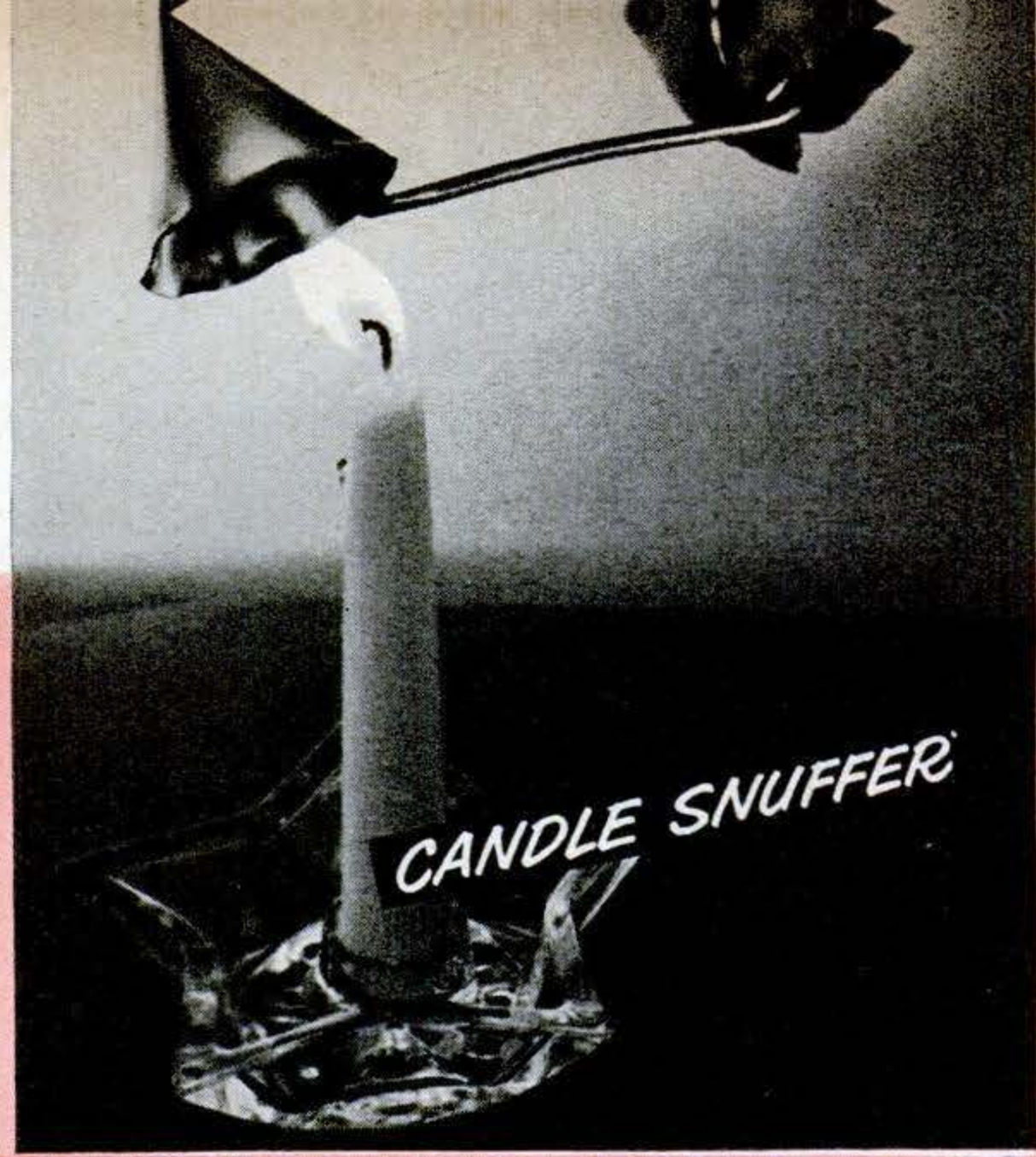
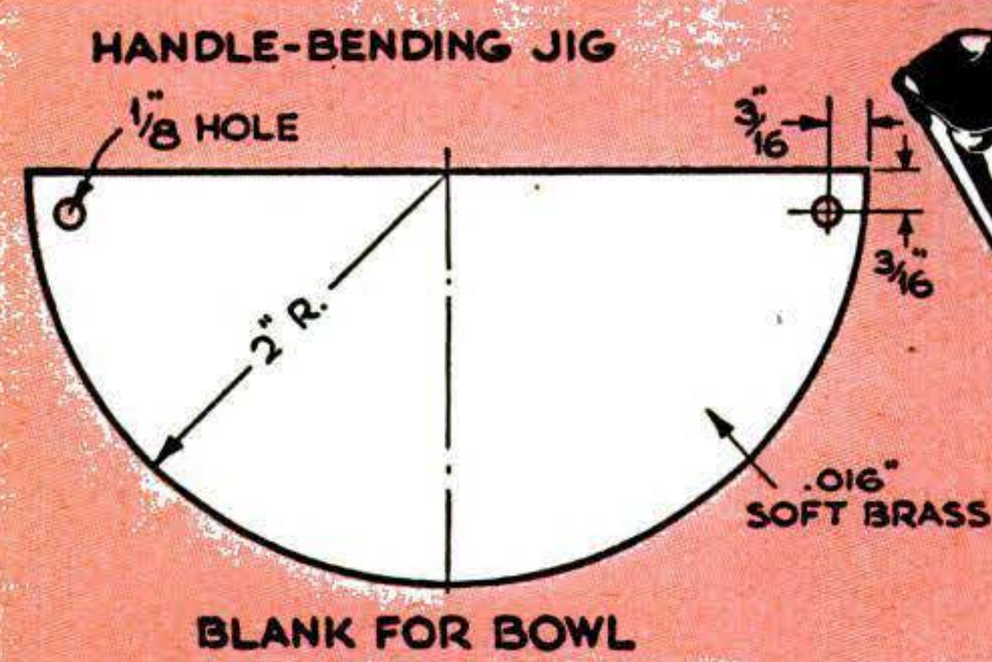
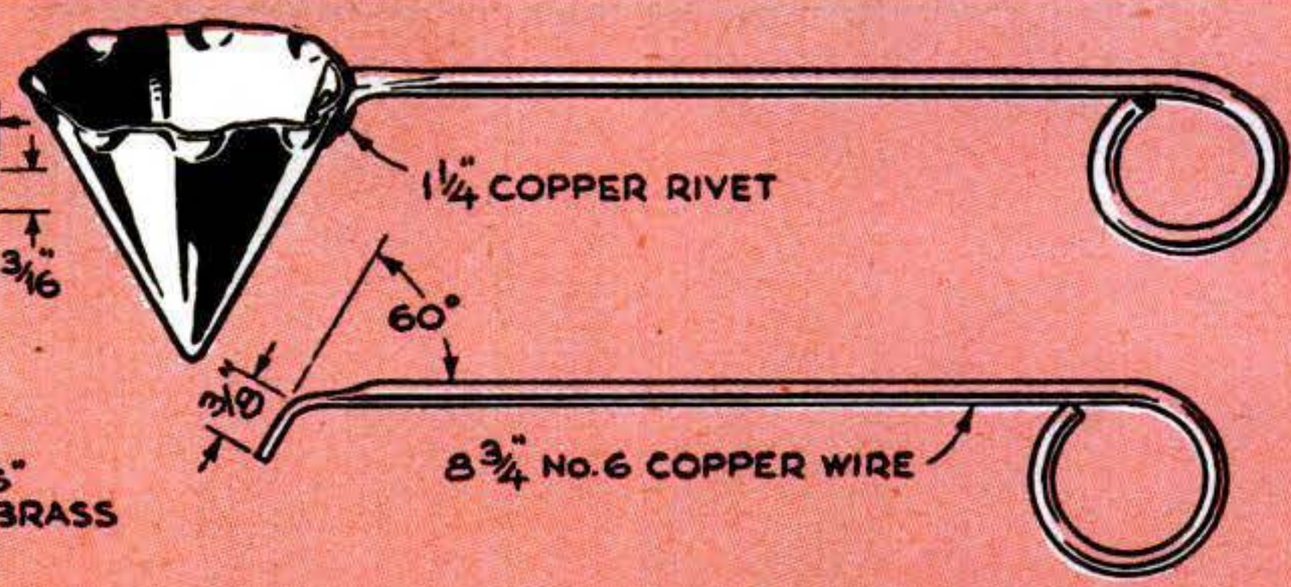
One Evening Shop Projects



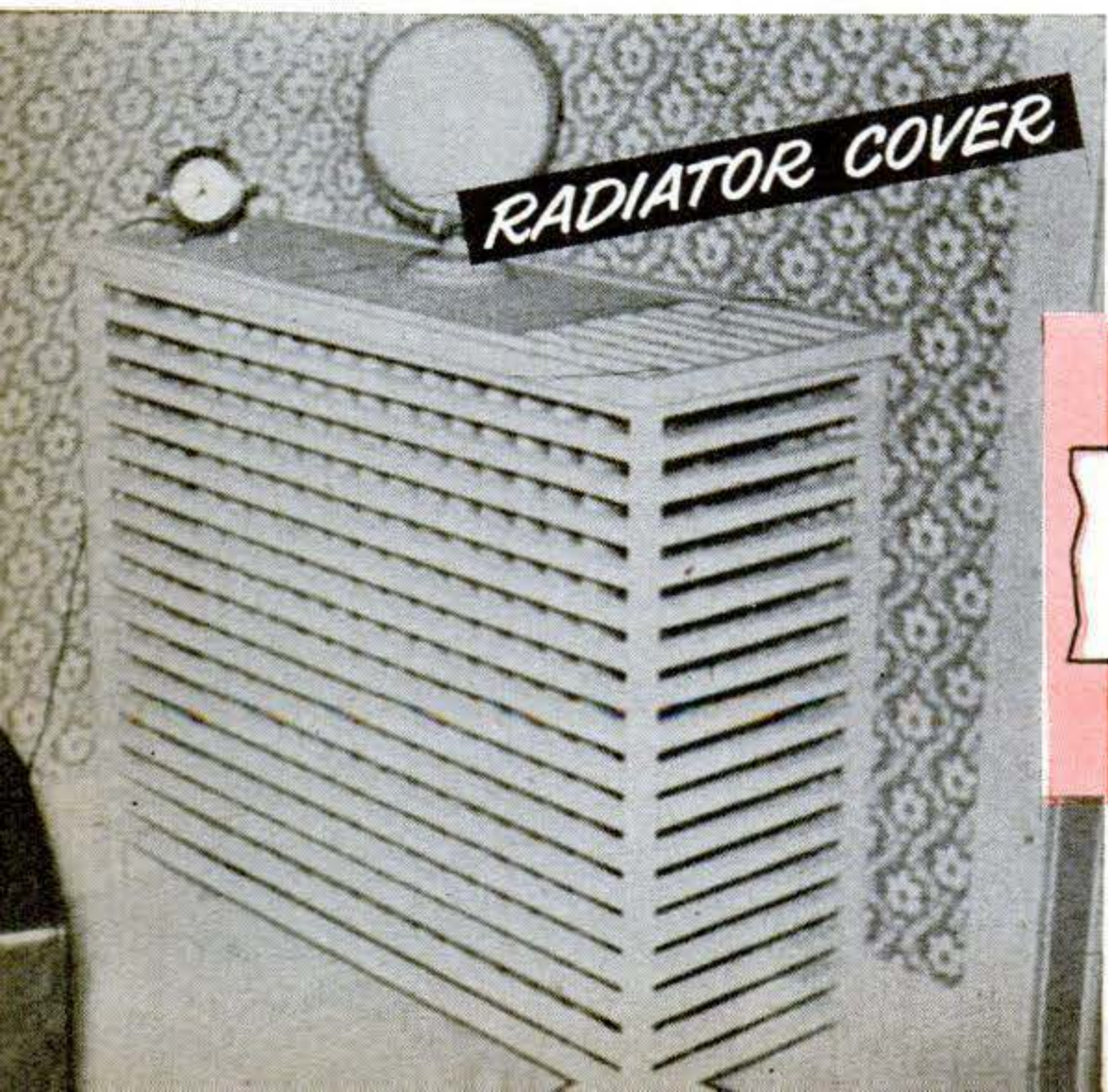




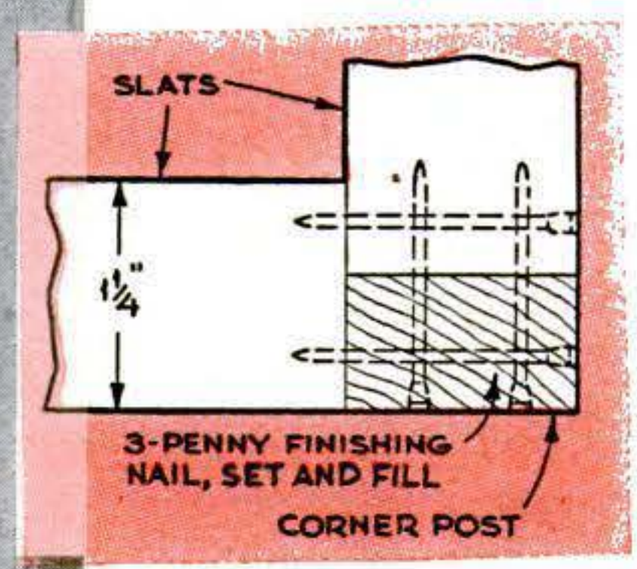


If your friends are as antique-happy as mine, you'll be kept busy making these colonial snuffers. I've been sweet-talked into turning out 44 so far. They go fast, though.

Bend a finger loop on one end of the handle wire, using the jig. Then flatten, drill and bend the other end. The bowl is formed into a cone with fingers and long-nose pliers. Close up the seam by tapping with a light hammer. A cut-down copper nail or bit of copper wire will serve to rivet the handle to the bowl. Bend the flutes with round-nose pliers, taking several bites and starting the flare about ¼" below the rim. Polish and apply clear lacquer.—*William V. W. Cokelet, Middletown, N. J.*



Attractive camouflage for a radiator without blocking heat—that's what this latticework cover provides. The open top dries light laundry too. It is made of ¾"-by-1¼" stock. The crosswise slats, placed flat 1¼" apart, are butted against the uprights. The latticework top is a separate unit nailed to the vertical sections. Make the cover to clear the radiator by 3" on all sides.—*Peter W. Westburg, Santa Monica, Calif.*



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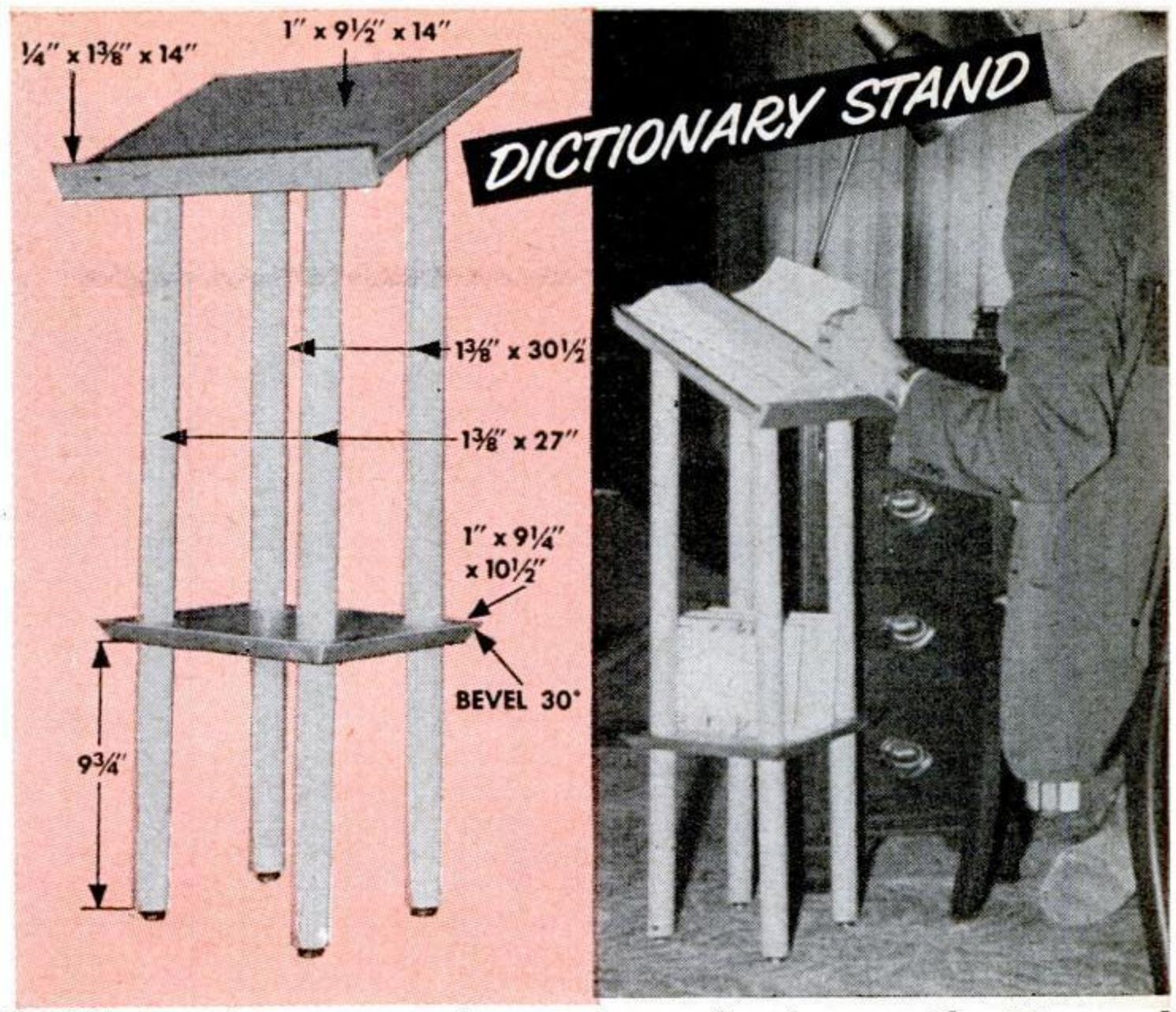
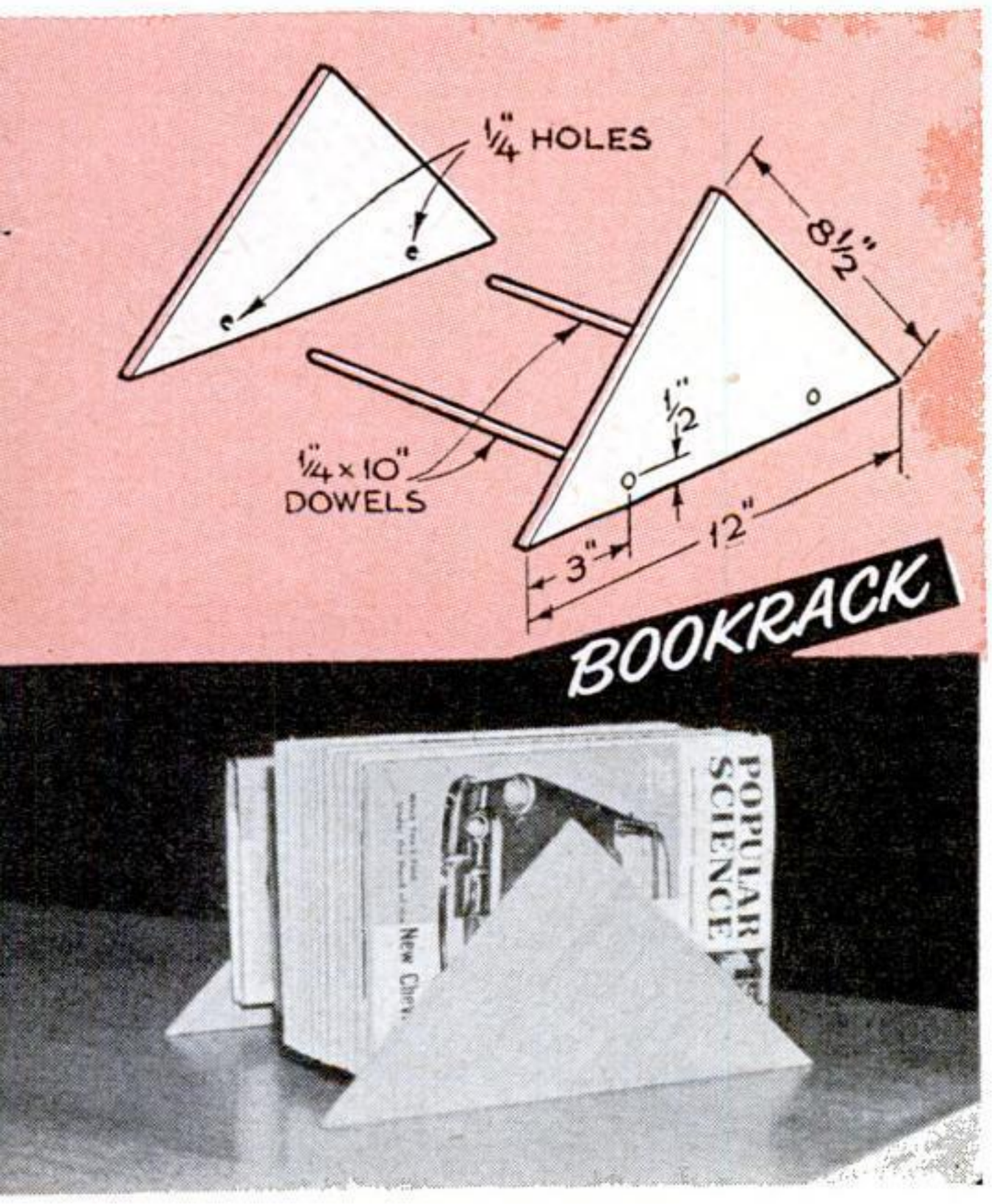
There is less excuse for not looking that word up if the dictionary is beside you on a convenient stand. This one, dimensioned for the popular collegiate editions, was made mostly from 1⅜″ dowel and 1″-by-10″ clear pine. The height and angled top make for easy reading from a desk chair.

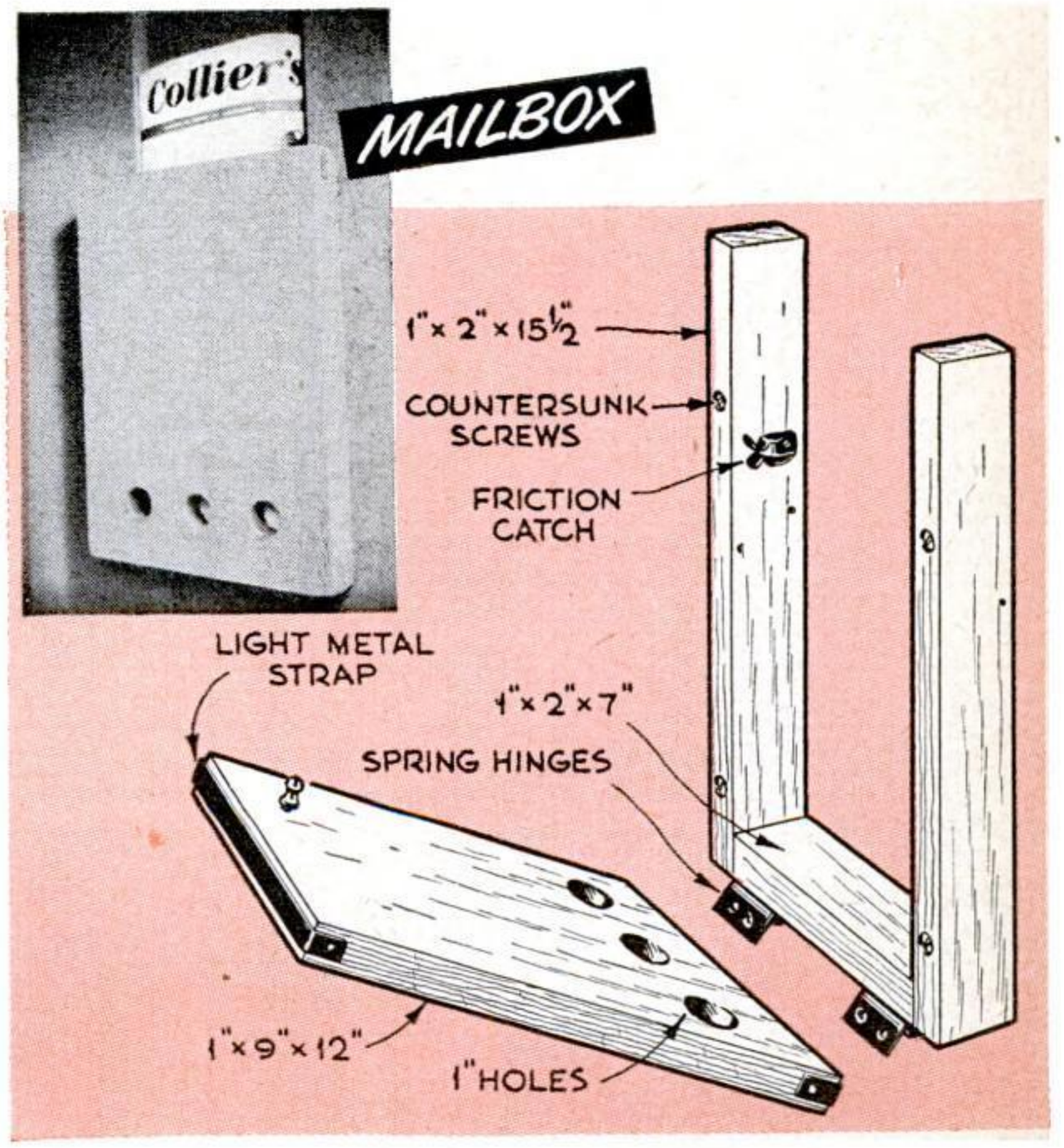


The lower shelf has holes for the legs bored with an expansive bit 1½″ from the corners. The top is beveled on three sides and a lip is screwed to the square front edge. After the legs were cut at a 30° angle at the top, sanded and slid through the lower-shelf holes, they were pegged in place with 2″ lengths of ¼″ dowel. (Make sure the slanted tops of the legs all face the right way.) The pegs can be sawed off flush after insertion. The top shelf was fastened to the legs with 2″ wood screws, countersunk and plugged.

The stand shown here was simply sanded well and given a coat of clear lacquer.—*E. L. Britt, Westport, Conn.*

For a neat bookrack, saw two triangles from ¼″ plywood, bore matching holes near the bottom edge of each piece and assemble with two 10″ lengths of ¼″ dowel, glued in. Sand it, finish it—and there it is.





No finish at all was applied to the 1″ rough redwood used to make this simple mailbox. The rustic look blends nicely with a modern house. The frame is mounted with countersunk screws. Three holes in the door show the mail.—*Hi Sibley, Nuevo, Calif.*

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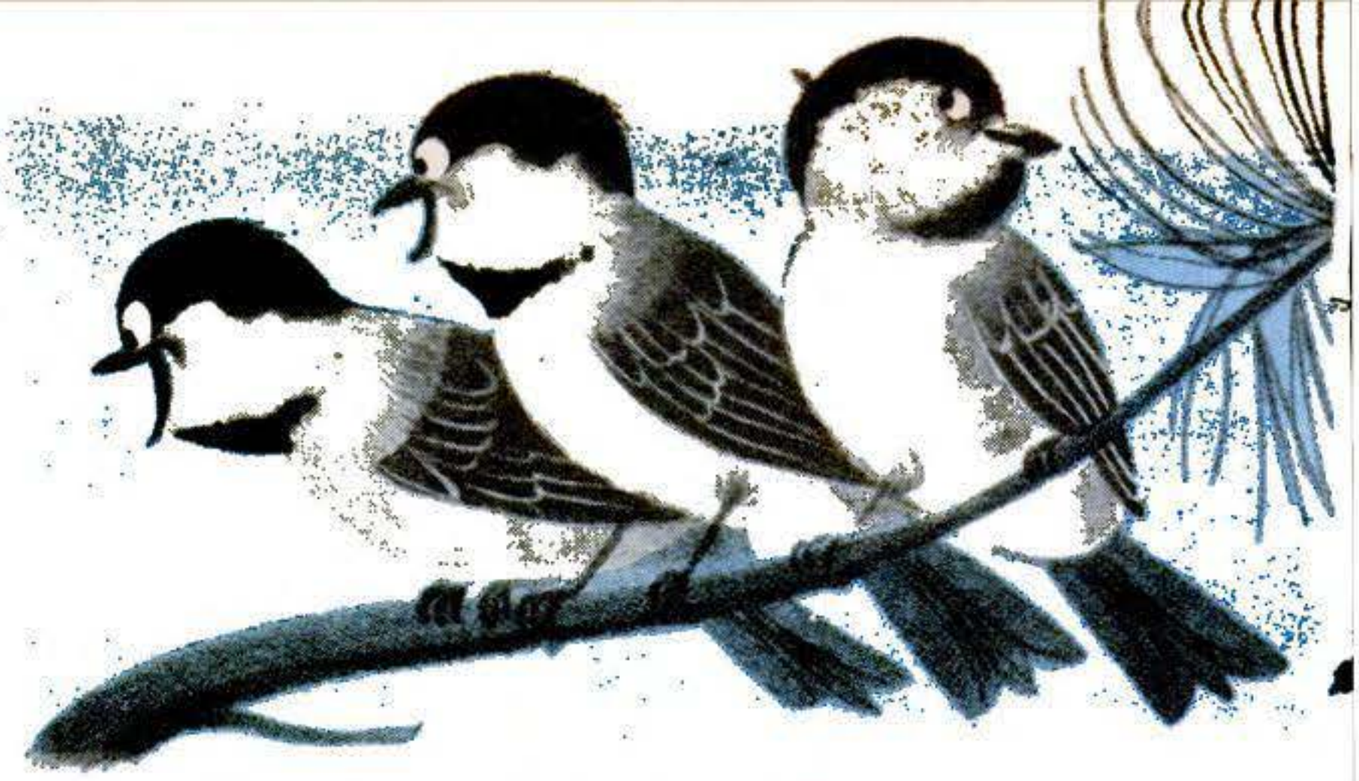


HOW TO BUILD AND OPERATE

Dining Rooms

BIRD BLUE PLATE

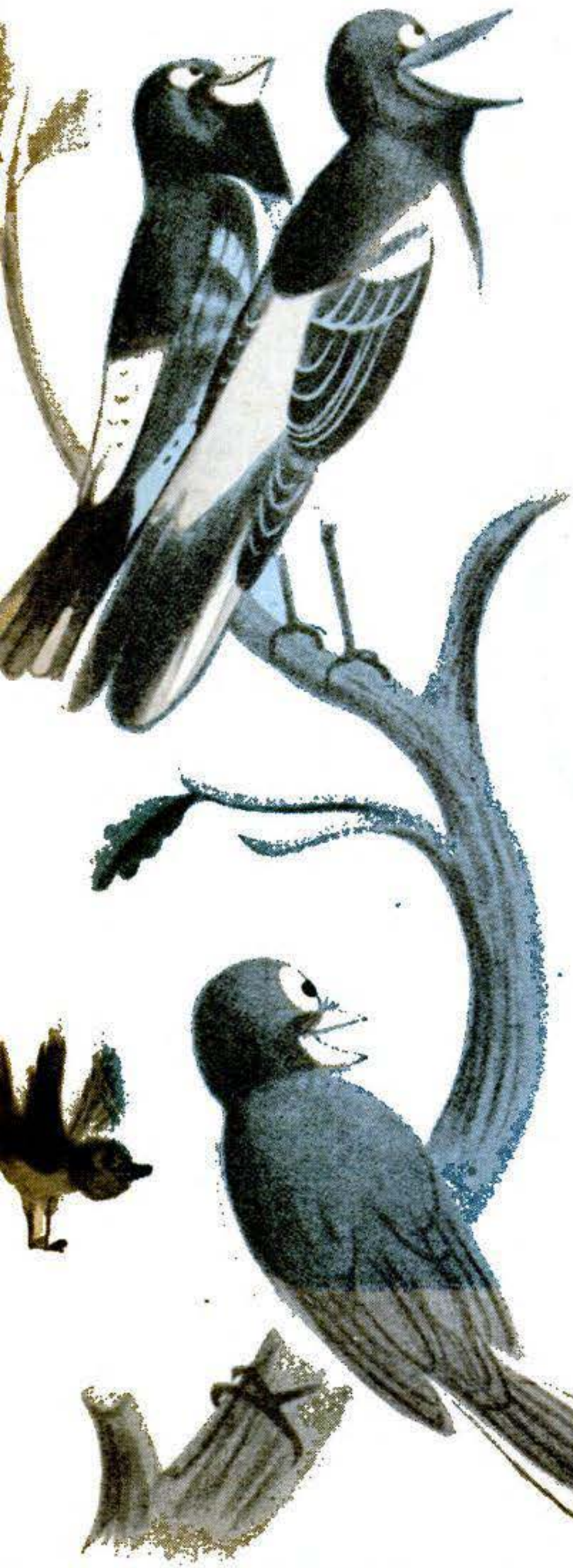
Chickadees, Woodpeckers, Nuthatches, Titmice, Creepers, Kinglets, Jays

Chickadees, Nuthatches, Cardinals, Finches, Grosbeaks, Jays

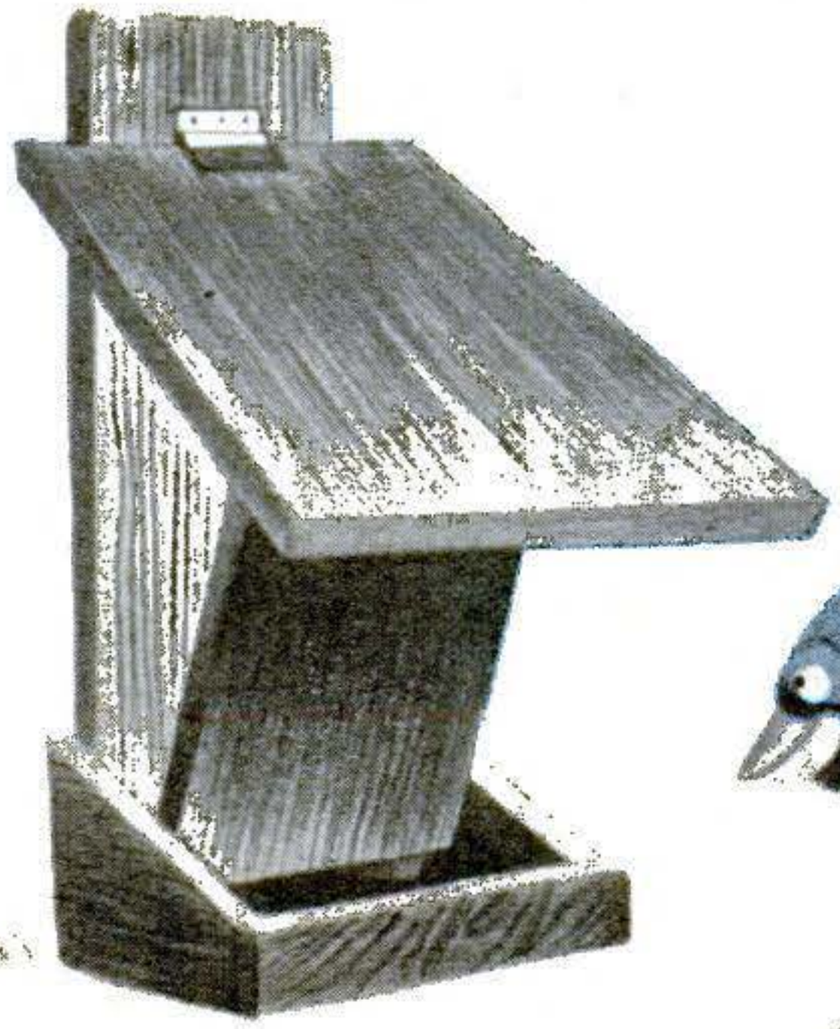
Juncos (Snowbirds), Sparrows, Finches

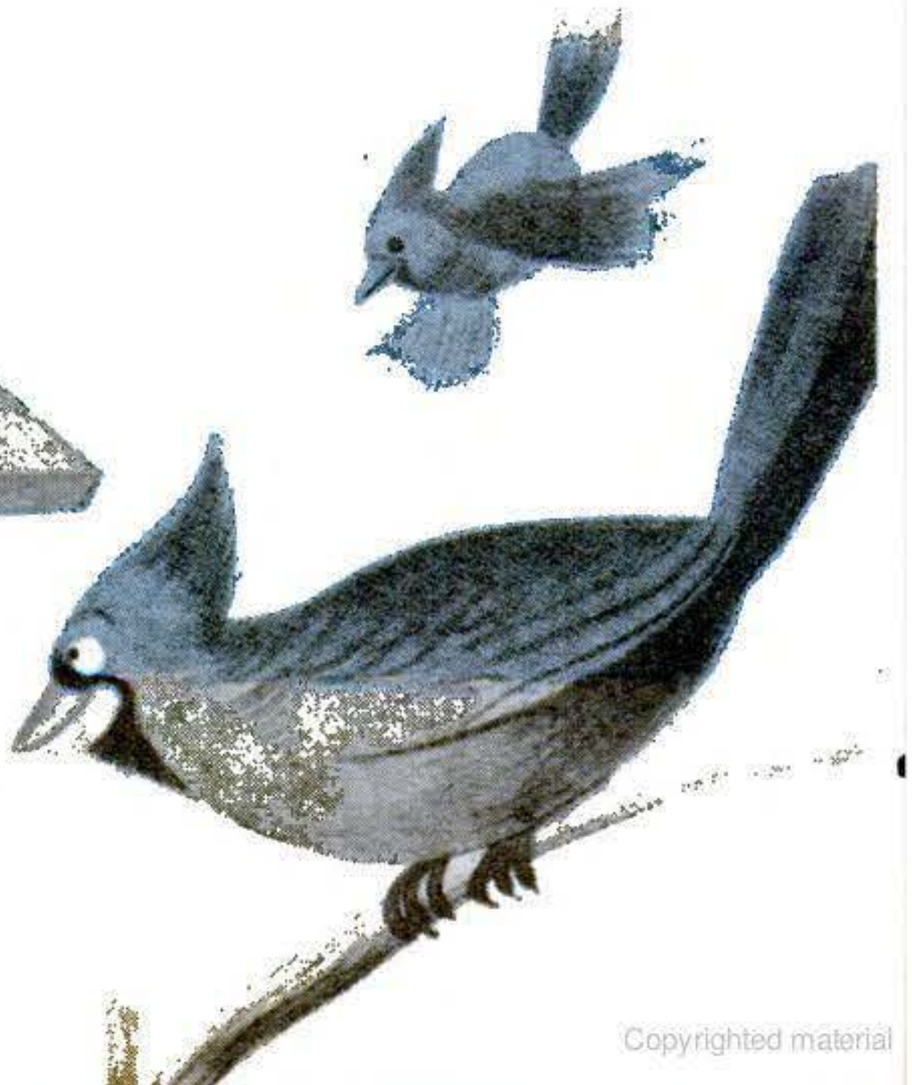
Chickadees, Nuthatches, Cardinals. Titmice, Jays

Chickadees, Sparrows, Jays



ALSO any stale bread, cake, crackers, broken into small pieces; chicken feed, bacon strips and meat trimmings. Peanut butter should be mixed with fat or it may strangle a bird. Suet in feeders should be chopped fine so big birds can't make off with all of it. Avoid metal holders for suet; birds may hurt eyes by contact on a cold day. A little sand on the ground when snow has covered it is appreciated by the birds. It aids their digestion.





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Now's the time, and here's the way, to make four basic types of feeders.

MY SON was kibitzing while I made some bird feeders and he asked, "Why is that weather-vane feeder supposed to be the best, Dad?"

"Because the vanes, or tails, keep it turned away from the wind, Phil. This means the birds always have a calm and sheltered spot in which to feed."

"I like the one you made for outside my window," Phil remarked.

"Your window has southern exposure," I said, "and that's always a good location for a feeder. Ought to see lots of birds there. That's why it's got a glass roof—to give you a bird's-eye view."

Phil smiled. "It didn't take you long to make these, Dad," he declared. "Any more coming up?"

"No," I answered. "These are more than enough to take care of our birds and others would be more or less

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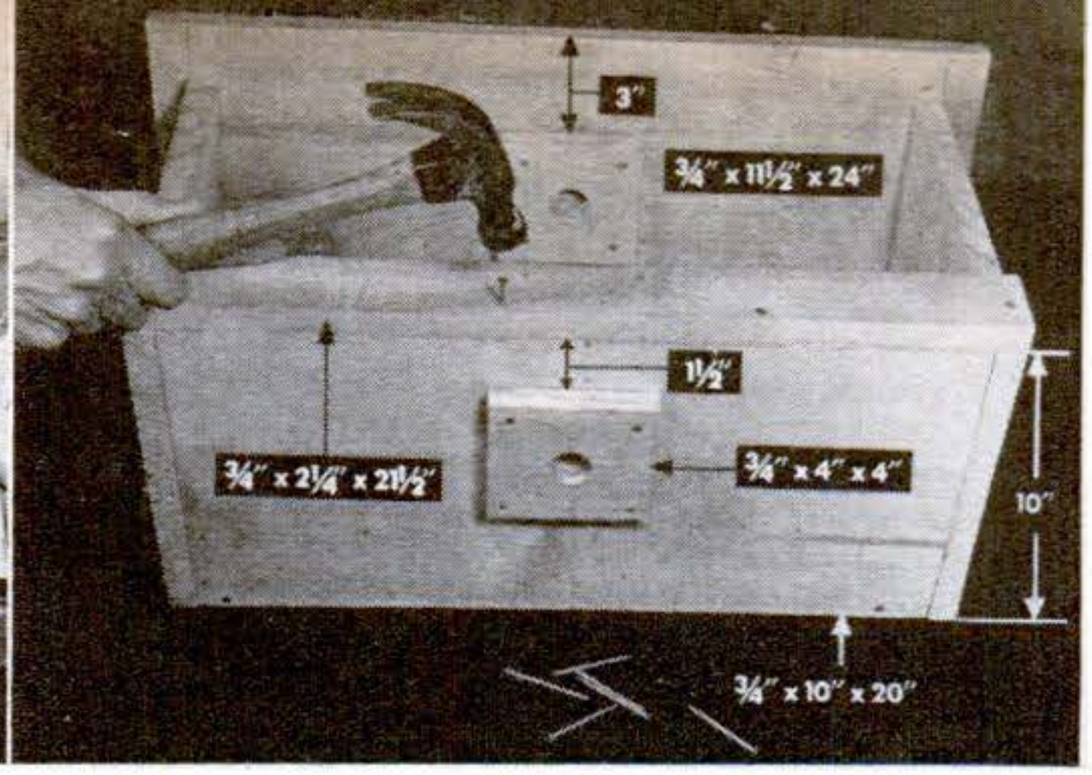
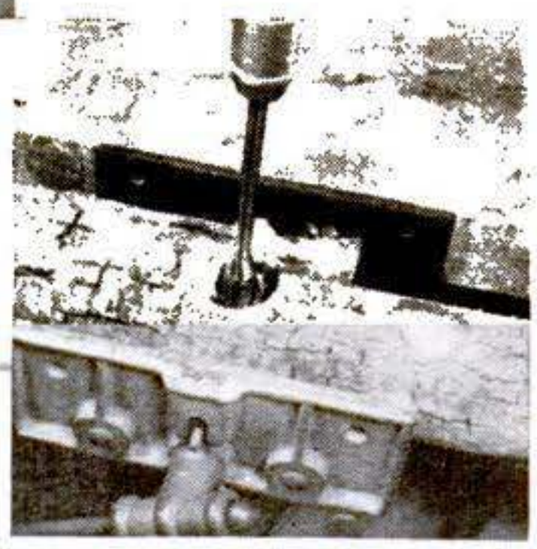
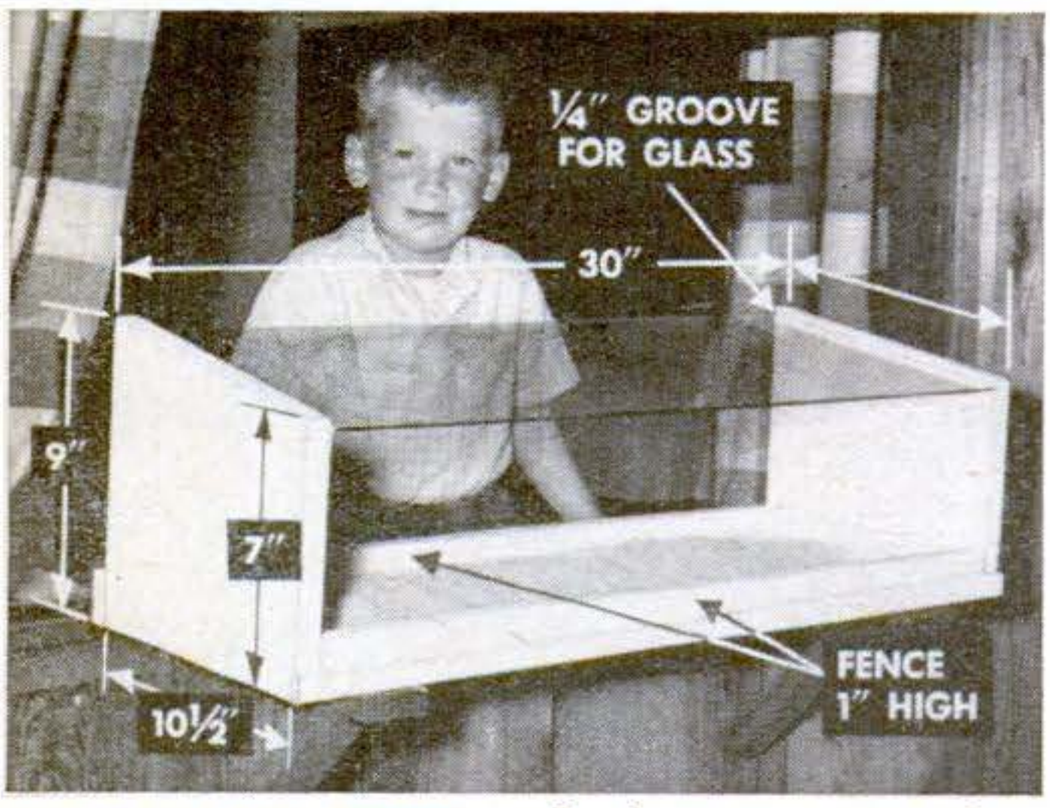


WEATHER-VANE FEEDER can be built mostly from ¾" lumber. To give pitch to roof, tops of endpieces are cut at a slant—from 12" at front to 10" at back. Collars 4" square are nailed under top and bottom to hold feeder steady on pivot made of a hardwood broom handle. Locate the collars equidistant from ends. Back of feeder is butted inside the other members. Vanes can be made from ½"-by-6"-by-18" board; saw it diagonally. Attach vanes so they project 12". Attach broom-handle pivot 5' from the ground.

SEED FEEDER is nailed to tree or building. Hinged cover makes filling easy. Front panel comes down to about 1" from bottom to let seeds trickle out in tray. Easy to build, feeder can be made any size desired. This one is 7¼" wide, 20¾" high. Cover is 11¼" by 14".



LOG FEEDER is made by drilling 2" holes 1½" deep in firewood-size log. Nail feeder to a tree or suspend it from branch. Put suet or peanut butter in holes with seeds inserted.



WINDOW-SILL FEEDER with glass top gives fine view of birds at close range. Length can be varied to suit window where you'll put it. Grooves for glass can be cut with handsaw. Small brads at end will keep glass from slipping out of groove. Brackets support feeder.

duplicates. These are the basic bird feeders."

"Pretty neat," said my small-fry spectator, "making one out of that log. Didn't cost a thing, did it?"

"No, but then I built these others for almost nothing, too. They're made from scrap lumber, ¾" pine and redwood."

"And even from Mom's old broom," laughed Phil.

"That's right," I said. "I cut off part of the handle to make a pivot for the weather-vane feeder."

"Will the birds really come, Dad?"

"You betcha," I replied. "In the winter, when their scant food supply is often buried under the ice and snow, birds appreciate a handout. And I figure it's only their due, because we could never have a decent garden without them."

A Chance to Identify Them

"What kind will show up, Dad?"

"Well, mostly the birds you see around during the winter—chickadees, sparrows, woodpeckers, kinglets, juncos and jays. But occasionally summer birds are known to stay north all winter if food is put out for them."

"Gee," exclaimed Phil. "I'll have a good chance to see how many I can identify. What are we going to feed them, though?"

"That's a good question," I replied, "because I expect you to keep the feeders stocked. Once you start feeding the birds you should keep it up until spring. We'll try to attract all kinds. That means we ought to put out sunflower seeds, mixed seeds, ground peanuts and peanut butter. Fat trimmings and stale bread help too . . . Come on, this feeder is done—let's put it up."—*Jerry Parker, Sonoma, Calif.*

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This is a Syncro Electric Jig Saw that is a complete unit in itself. You can carry it home under your arm, set it on a table or work-bench, plug it in, and proceed to work on it.

Now this blade gives you 14,400 smooth strokes per minute, just about 5 times as fast as the ordinary jig saw blade. It is especially well suited to delicate fret saw work and it always cuts that smooth edge that requires no sanding. This last feature alone will save you many hours of time which you would ordinarily spend sanding such things as what-not shelves, magazine racks, fern stands and the many other things that you will like to make.

You will find that all the forests of the world are right at your elbow to provide you with rare and beautiful materials for your handicraft. But even with that, you are not limited to wood. Plastic materials are now appearing in a large variety of colors.

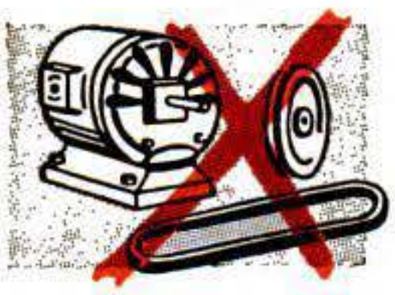
For instance, catalin, a molded plastic. It is comparatively easy to work on this jig saw and takes a beautiful polish. Not quite so easy to work, however, as bakelite. Bakelite, for a cast plastic, is hard and brittle and the ordinary saw cuts kind of a splintered or split edge on it. But the high speed and the fine teeth in these Syncro blades always insure a clean cut. You will find that these various plastic materials are particularly nice for working out such things as monogram pins, belt buckles, picture frames and wall lamps.

Now comes the best news of all. Parents especially are glad to know that here is a power jig saw that is safe also for boys and girls to use. Accidental injuries on this machine, even the slightest cuts, are very rare. Serious injuries are impossible. Now that may seem strange to you but the reason is very simple . . . the Syncro blade does not "pull" the "work" or finger towards it as belt-driven jig saw blades do.

If you happen to have seen a Boy Scout Troop doing handicraft metal work, you will always find a jig saw one of their main tools. Perhaps you have various ideas that you would like to work out in metal; a name plate out of aluminum, a shadow lamp out of copper, or book ends out of brass. You can do all these things on this same machine using the same one blade to cut all those different types of metal, as well as wood, cardboard, etc.

And remember that you can do all these things without a great deal of expensive equipment. Actually with only one machine—one jig saw and one blade—one saw you can carry home under your arm, plug it in and go to work on it.

It comes complete with 6 blades and there is nothing else to buy. No belt, no pulley, no motor, or anything else. It is all complete (including built-in motor) in this one unit. The built-in power unit is also guaranteed against burn-out all during your ownership or is replaced free. Syncro is a precision-built, UL-Approved, durable tool and will last a life-time. Syncro electrical precision products have been made for 30 years. Your hardware dealer should have one on display.



However, if he is out of stock or no store is near you, send only $24.95, direct to Syncro Corporation, Dept. G-103, Oxford, Michigan, and your Syncro Jig Saw No. 201 will be shipped to you postpaid. Use it 10 days, then if it does not please you 100%, return saw postpaid to Syncro and your money will be promptly refunded. Or send postcard for Free Circular of Syncro saw and Syncro sanders.

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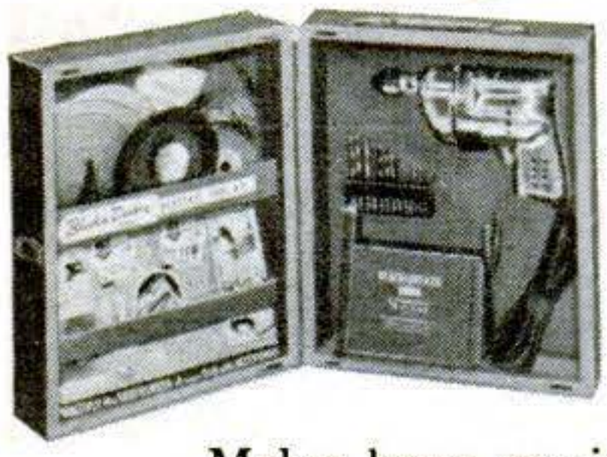
MEN! *Here's how to get the Black & Decker tool you want this Christmas—*

CUT OUT—PUT WHERE YOUR FAMILY WILL SEE

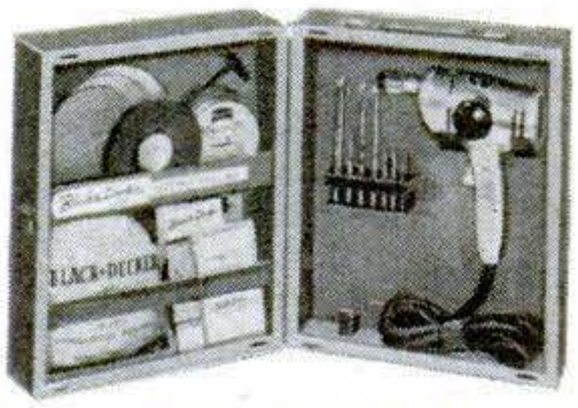


NEW!
¼″ Deluxe DRILL KIT
only **$46.95**

Makes home repairs, projects easy! Includes ¼″ Utility Drill, horizontal stand, wire wheel brush, grinding wheel, arbor, 13 drill bits, paint mixer, sanding pad and discs, in steel case.

DO 1001 JOBS!
Home chores actually become fun when a B&D Drill replaces hand labor! Remove paint & rust, sharpen cutlery, put up shelves faster, easier and neater!

NEW!
¼″ All-Purpose DRILL KIT
only **$52.50**



Includes: ¼″ All-Purpose Drill, 7 drill bits, 3 wood bits, countersink, sanding pad and discs, polishing bonnet, electric wax, and paint mixer, in fitted steel box that can be mounted easily on your workshop wall and quickly removed for carrying to the job. The perfect Christmas gift!

No. 44 SANDER Fast-cutting, powerful orbital sander gives satin-smooth finish on wood or metal; eliminates hand sanding. Powered by B&D-built motor. Only **$46.95**

For free booklet, "Handy Tips for Handy Men," full of hints for home repairs and projects, write: Bob Davis, Dept. H11S, THE BLACK & DECKER MFG. CO., Towson 4, Maryland.

Black & Decker
UTILITY
PORTABLE ELECTRIC TOOLS

Gus Goes Hunting . . . for Trouble

[Continued from page 198]

Harvey stepped on the starter, but the engine only cranked.

"That's tough luck! I'd better check your ignition."

"Ain't much time left. Can't you get on your horse a little, Mr. Wilson?" There was irritation in the Texan's drawl now.

"I'm going as fast as I can."

Gus checked the ignition wires all the way from the switch to the coil and the distributor, and to each of the plugs. That took another precious 15 minutes.

Gus Hangs on to His Temper

"That wasn't it, either. I'll be darned if—"

"Are you checkin', Mr. Wilson, or just guessin'?" Bill Harvey asked.

Gus controlled his temper and went about his work. The last item he checked was the fuel line. From tank to pump, he checked carefully. There were no breaks in the line, and no kinks from the rough going. The flex line by the pump was clear, though it did seem to be harder to blow through than it should have. "Try it now, Mr. Harvey."

The engine caught after a minute or so. But as before, it ran only long enough to get warm before the engine died.

Gus had a glimmer of an idea then. The flex tube had offered a little resistance to his lungs. It lay close to the hot engine, but it had been only warm when he had blown through it. Now that the engine had run again for a short time, the flex line was warmer. What if—it was just a hunch—but Gus detached the line again and tried to blow through it. This time, it was completely blocked!

A Quick Hunch Pays Off

"Well, there it is."

"That flex line? Why was that so hard to find?"

"I'll tell you why. This line has that long-lasting metal weave on the outside. But the inside is just lined with synthetic rubber. You know how rubber gets brittle and cracked when it's old. It finally gave out on you, and every time the engine gets warm now that section expands and twists enough to block your fuel. When you let it cool, it settles back and lets fuel pass through. Luckily, I've made the habit of carrying a couple of spare flex lines in my kit. You'll be on your way in a minute."

[Continued on page 258]

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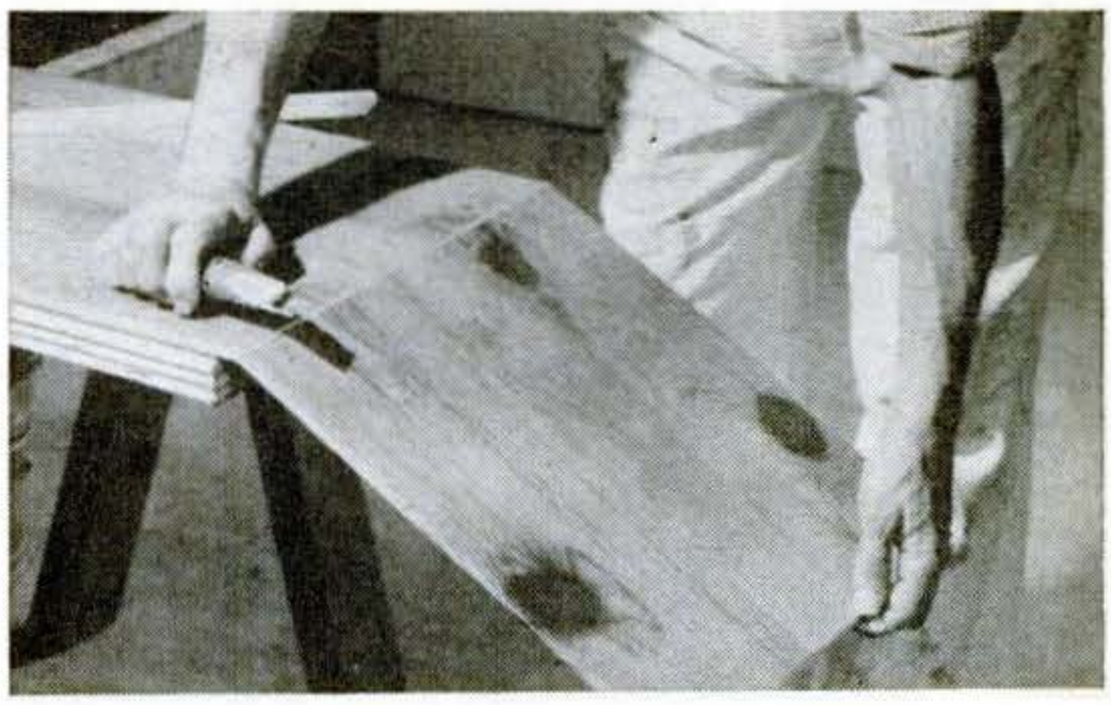
"PINE PANEL" YOUR WALLS

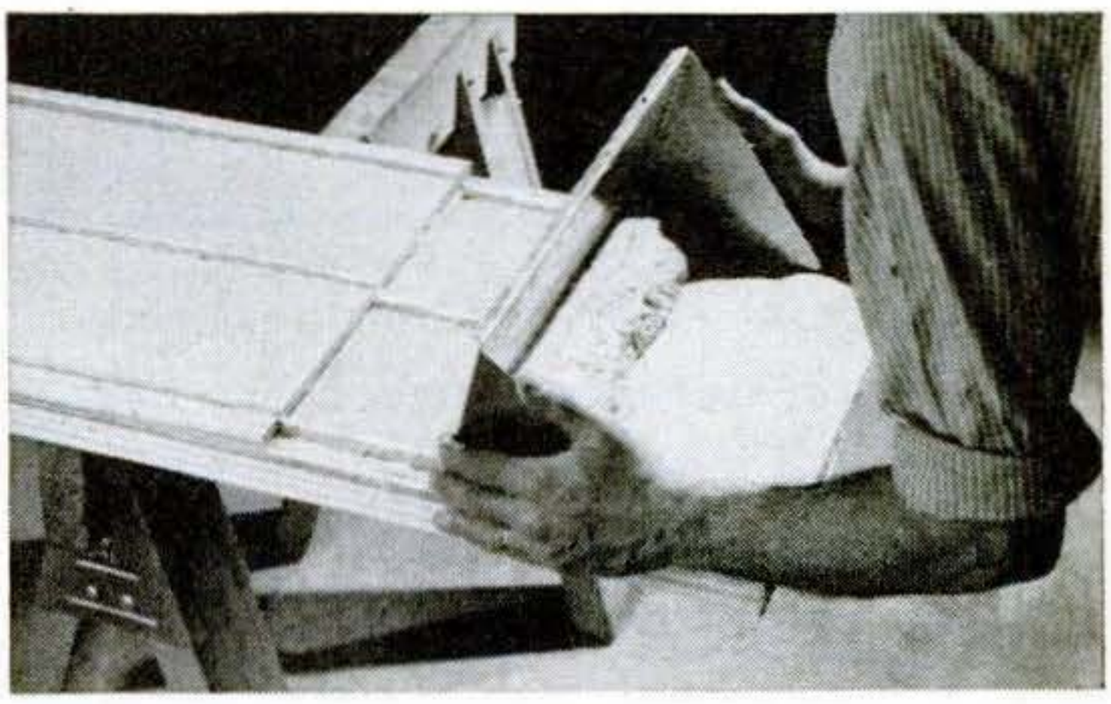
with Gold Bond Gypsum Wall Planks...the newest in Gypsum Wallboard!

It's an easy, one-man job to put these new lightweight planks right over dull, drab walls. Prefinished Gold Bond *Knotty Pine* and *Bleached Walnut* give you the beauty of fine wood paneling at a fraction of the cost. *Standard* Wall Plank can be painted, textured or wallpapered. See your Gold Bond lumber and building material dealer today!



(1) Gold Bond Gypsum Wall Planks are only 16" wide, weigh only 16 lbs. in the 8' lengths. They are simpler to cut than wood—just score and snap (above), or saw if you wish. Unlike wood, they are FIREPROOF!

(2) A special Gold Bond Laminating Adhesive is all that's needed to apply these wall planks. Just mix the adhesive with water, spread on the back of the panels and press into place. No joints to conceal, no nailheads to treat.



(3) Here's how you spread the adhesive on the plank. Your Gold Bond lumber and building material dealer will supply this 3-notch spreader which simply slides along the plank leaving three straight ridges of cement.

(4) Apply first plank at a corner. Press plank firmly against the wall to insure even adhesion, and use a carpenter's level to plumb. Install three planks and re-plumb. Then continue across the wall.

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Fireproof Wallboards, Decorative Insulation Boards, Lath, Plaster, Lime, Sheathing, Roofing, Sidings, Wall Paint, Textures, Rock Wool Insulation, Metal Lath and Sound Control Products.

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Please send me a complete description of this new remodeling system, and complete instructions for applying Gold Bond Gypsum Wall Planks.

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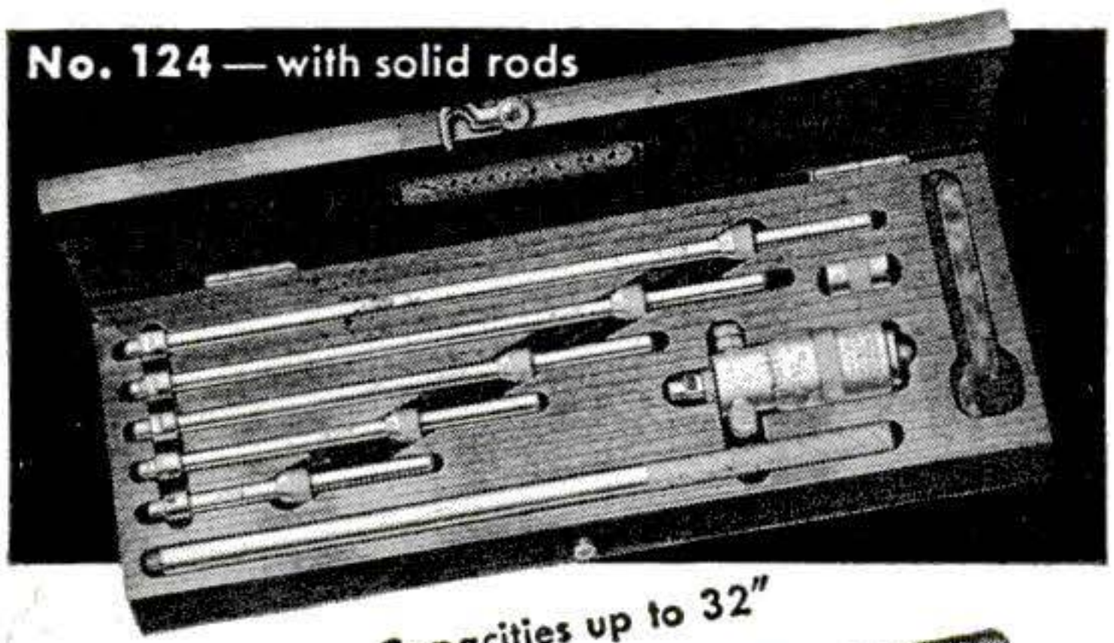
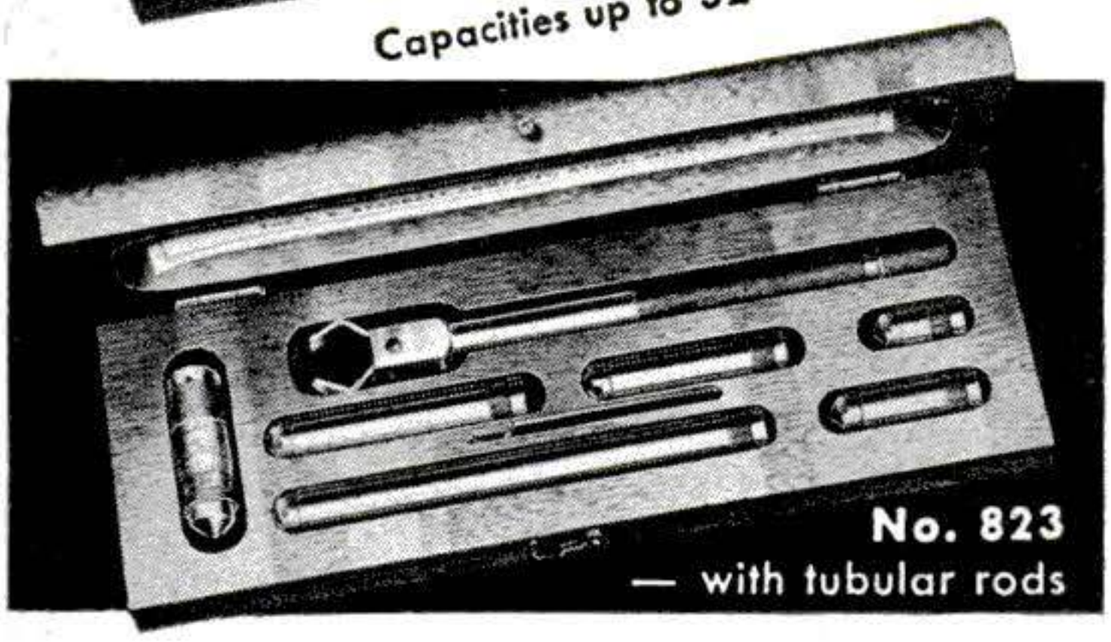
Starrett® Satin Chrome INSIDE MICROMETERS





Choose your favorite from these two excellent inside micrometers. No. 124 has small diameter solid rods while No. 823 has light yet rigid 3/8" diameter tubular rods. Both have Satin Chrome Finish on micrometer heads to eliminate glare, retard corrosion, increase reading speed and accuracy . . . also, hardened and ground contact surfaces plus compensation for wear. See them today — at your Starrett Tool distributor's.

SEND FOR IT — ONLY 10¢
Starrett "Tools and Rules" Book
shows the right tools for any measuring job. 50 pages, 100 pictures, helpful reference tables. Address Dept. PS

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STARRETT TOOLS
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Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR
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MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

Gus Goes Hunting . . . for Trouble

[Continued from page 256]

Gus connected a new line to the pump and started the engine. It kept going.

The Harveys and Gus piled in, and began a jolting, tree-dodging rampage down the hillside. But it looked as if their wild ride would be in vain. By the time they got back to the road, it was only 12 minutes before the contest deadline, and Gus figured it was at least seven or eight miles into Parsonsville.

Nevertheless, Gus hurried as he climbed into his truck and wrote out a bill.

Gus's Turkey Dinner Flies Away

When Gus arrived back at the garage, and looked questioningly at Stan Hicks, the boy shook his head. "I told you, boss, you'd better buy a turkey!"

"I guess I'll have to settle for Sam's hamburger," Gus grunted, starting for the back shop to close up.

He was hardly out of the office door when the phone rang. Stan answered it.

"For you, boss."

"Hello, Gus Wilson speaking."

Bill Harvey's unmistakable drawl drifted through the receiver.

"I reckon you're pretty disgusted with Texans at this point, Mr. Wilson. I'm afraid I wasn't a very good example of that particular nationality today. I was pretty sore at my car, and when I thought we were going to miss that contest . . . Well, I want to apologize for takin' it out on you."

—But Something Better Turns Up

"*Thought* you were going to miss it . . . Did you get there in time after all?"

"Sure did, with at least half a minute to spare, and our buck won hands down. We're home now—over at my boy's place—and we got more deer meat here than we could get away with in a month o' Sundays. We were wonderin' if maybe you'd give us the pleasure of your company at Thanksgiving dinner tomorrow . . . We're havin' venison steaks." END

Definitions

BROUGHT before the court, the motorist declared:

"Your honor, I was not drunk. I had only been drinking."

"That's different," said the judge. "In that case, I'm not going to send you to jail for a month—only for 30 days."—*The LIFE Aetna-Izer.*

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"...and bring Daddy some Bonney wrenches"

Daddy's been prompting *this* lad. Not a bad idea, either. A word to the right person *now* will pay off at Christmas.*

Any man wants wrenches he can be proud of. That means Bonney wrenches—mechanics themselves call them America's finest.

Your Santa Claus can buy Bonney wrenches wherever fine tools are sold—in open stock or complete sets.

• • •

Bon-E-Con tools, also, carry the famous Bonney guarantee. They're tools any man would value—at prices anyone can afford.

* *Confidentially, men, it would be smart to leave this page where the right person can't miss it!*

BONNEY FORGE & TOOL WORKS, ALLENTOWN, PENNSYLVANIA

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Moon's Mysteries Challenge Spacemen

[Continued from page 130]

the ground, surface swellings called "domes," and unexplained whitish "rays" extending from some craters—perhaps streaks of volcanic ash deposited by the last explosions of dying volcanoes. An impressive spectacle will be the Straight Wall in the Sea of Clouds—a sheer 800-foot cliff, 60 miles long. Its nearly vertical face remains blistering-hot after the ground has cooled, for it receives the setting sun's rays head-on.

Ancient Scenes Will Look Ghostly

Vividly the scenes will contrast with earthly landscapes—for these gaping craters, these jagged mountains, have been untouched by wind, rain, or frost.

These ancient scenes will look ghostly because nature has painted them in monotone. Shades of ash-gray, and the black shadows, replace the earth's bright colors. But picture-takers bent on shooting color film may discover a few rare exceptions. Most noteworthy example is a short-lived ruddy glow, first seen in the 1830s and only twice since, near the little crater Lichtenberg. The last time, in 1951, it lasted half an hour. Undoubtedly it's seen, the guidebook's author holds, when the sun's rays fall at a certain angle on "some unusual surface deposit"—another first-class mystery for future lunar explorers to investigate. END

***Next Month:* Watch for a Capt. McCann Ship Model**

The world's fastest clipper ship, *Sovereign of the Seas*, sails again on the pages of POPULAR SCIENCE MONTHLY in December. Step-by-step instructions for building a gleaming model of this famous ship, based on the original plans by Capt. E. Armitage McCann published in PSM nearly 30 years ago, will make this a fascinating project for all model-building ship lovers.

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universal POWER TOOL

with RADIAL ARM

Here's a complete workshop for the hobbyist or woodworking craftsman—all in one tool. Easy to convert . . . simple to operate, it's precision-built to finest professional quality. All moving parts glide on ball bearings. Tools lock in any position. The most versatile and useful all-purpose woodworking power tool ever developed!

it's a circle saw, drill press, sander, router, shaper, lathe

All in one

(slightly higher in zone 2) $269.95 LESS MOTOR

EASILY MOVED
All-steel stand tilts back on casters for easy moving.

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Send information on new Shopmaster Universal Power Tool TODAY!
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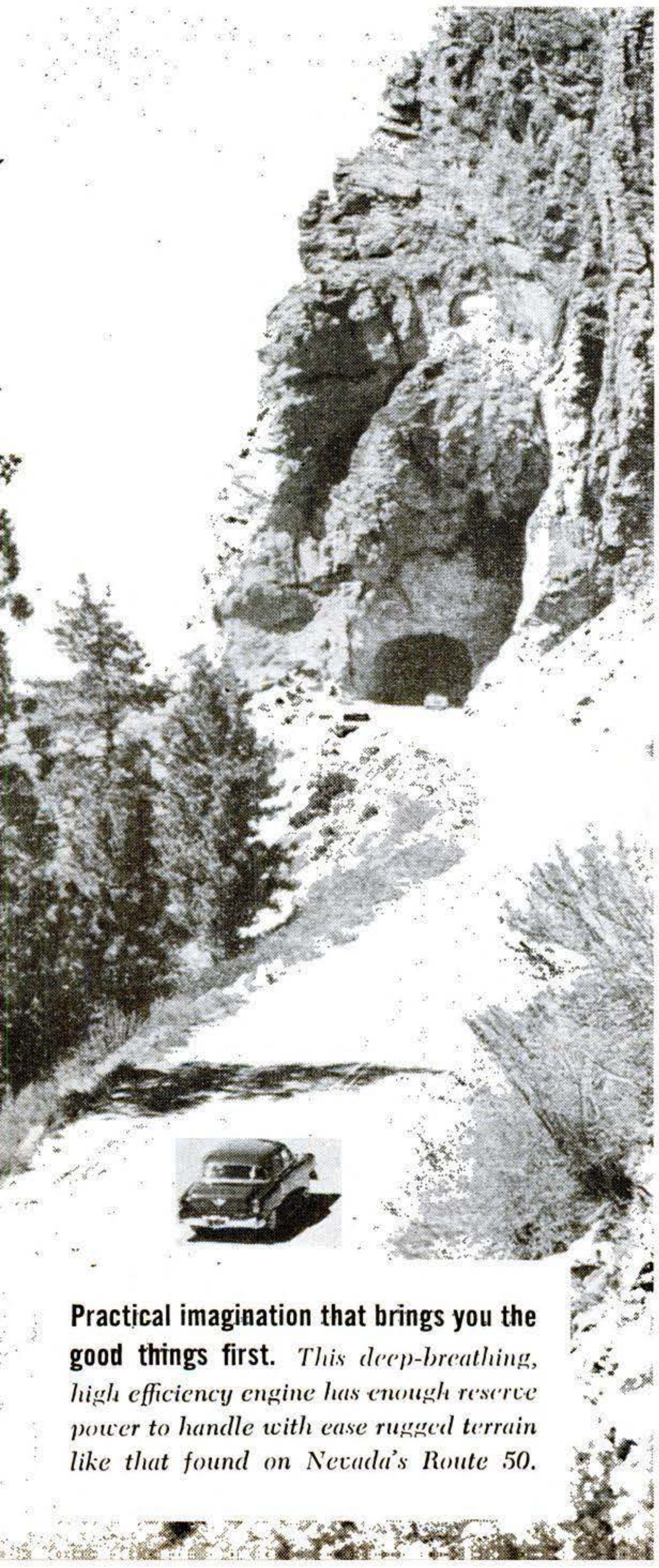
PRACTICAL IMAGINATION AT WORK FOR YOU

CHRYSLER CORPORATION'S "deep-breathing V8"

NEWEST, MOST ADVANCED CAR ENGINE

Compact, low-friction engine inhales and utilizes air and fuel more efficiently . . . gives you greater performance and safety, even on steepest mountain roads.

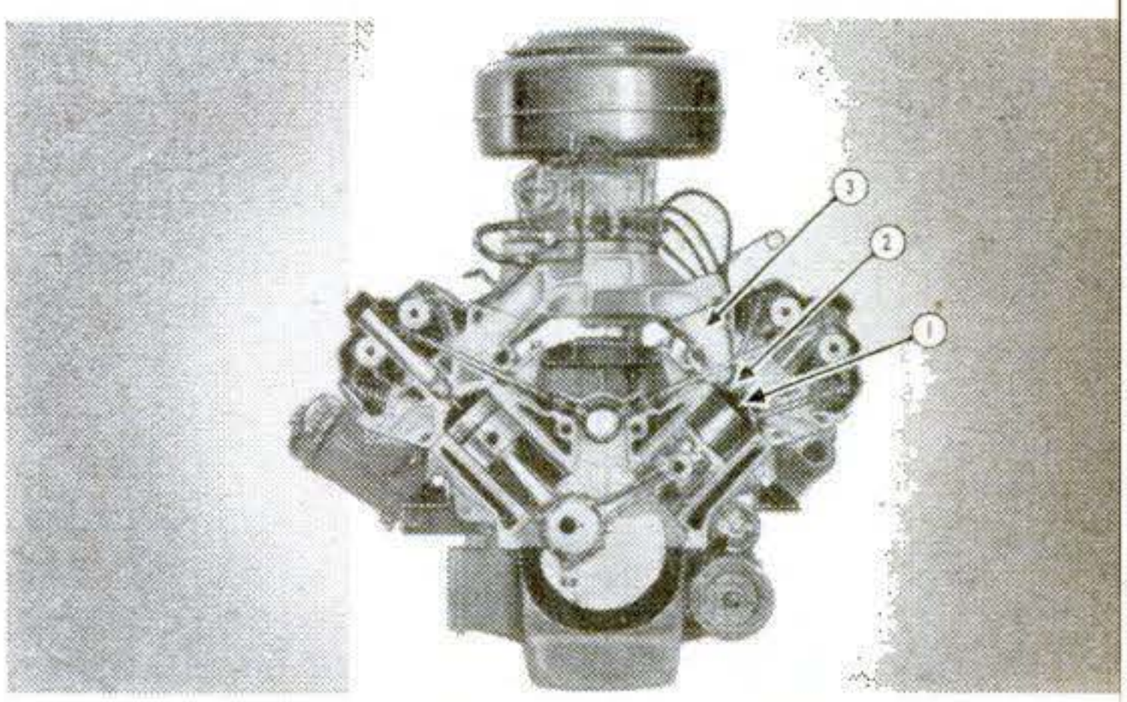


Practical imagination that brings you the good things first. *This deep-breathing, high efficiency engine has enough reserve power to handle with ease rugged terrain like that found on Nevada's Route 50.*

What's happened to automobile engine design?

At Chrysler Corporation, something spectacular! America's most advanced car engine, the V8 hemispherical combustion chamber design, is already turning gasoline into power more cleanly, more efficiently, than any other power plant for passenger cars.

This extraordinary engine, which is now being enjoyed by Chrysler, De Soto and Dodge V8 owners, actually *breathes* deeper through the wider, straighter fuel passages. Valves are larger, open wider. Spark plugs fire directly above pistons. So efficient is performance that the engine doesn't "carbon-up" with resultant power loss.



Cutaway view of Chrysler-built V8 engine showing (1) dome-shaped chamber, (2) bigger, high-lift valves, (3) wide fuel channel.

The new engine is another example of how practical imagination puts *more value and worth* into Chrysler Corporation cars. To get the "feel" of this Chrysler-built V8, call a Chrysler, De Soto or Dodge dealer for a demonstration . . . today!

Chrysler Corporation produces Plymouth, Dodge, De Soto, Chrysler & Imperial cars and Dodge Trucks, Chrysler Marine & Industrial Engines, Oilite Metal Powder Products, Mopar Parts and Accessories, Airtemp Heating, Air Conditioning, Refrigeration, and Cycleweld Cement Products.

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dramatic entertainment for the whole family on CBS-TV.

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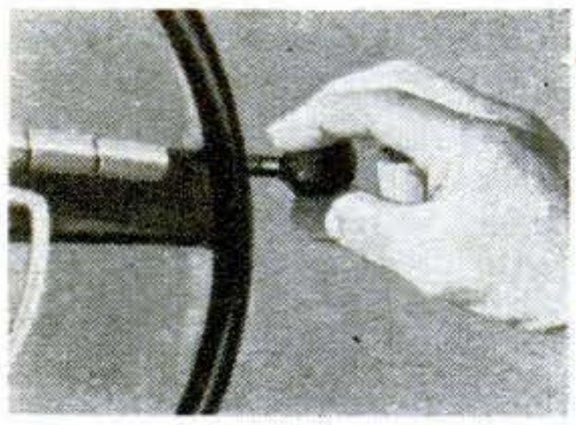
How to get more mileage out of your motoring dollar



SHIFT WITH CARE

Use low and second gears carefully when starting. It's the mark of a good driver to shift at low speeds — thus avoiding excessive engine wear and gas consumption. Experts agree the most economical shifting speeds are: low to 2nd—about 5 mph; 2nd to 3rd—between 10 and 15 mph

NEVER USE STRONG SOAP

Wash with a mild detergent or auto soap. Strong cleansers quickly wash away protective wax coatings . . . may wear paint. After a good wax job, water alone should get the car clean. Later, a little mild soap or detergent may help. Frequent washing keeps gritty dirt from working into and damaging the finish.

FINEST OIL FILTER

Keep a clean oil filter on the job. Your oil filter traps engine-wrecking abrasives and sludge out of engine oil. In time, however, any filter loads up—gets so clogged it can't filter anymore. Before that happens, put in a new Purolator Micronic*Refill. Accordion-pleated, plastic-impregnated element has up to 10 times more capacity than ordinary filters . . . stops dirt you can't even see. There's a Purolator* engineered for every make of car and truck. Refills cost as little as $1.60. Takes just a few minutes to install.

*Reg. U. S. Pat. Off.

Check your oil filter every time you change your oil

PurOlator

World's finest **OIL FILTER**

Today's Pirates Sail the Highways

[*Continued from page 117*]

What can other truckers do to foil the highway pirates? Here are some of the ways suggested at this year's FBI conferences on the problem:

1. Trucking firms should more thoroughly investigate people before hiring them. They might uncover potential finger men.

2. Warehouses, yards and loading docks should be constantly protected by watchmen. But even watchmen have been tricked. Therefore, central station alarm systems should be used. These may be either automatic or require periodic calls from the watchmen.

3. Trucks should be protected by alarm systems of their own (PSM, June '50, p. 136).

4. Guards should accompany the more valuable loads.

5. Two men should be assigned to every truck making pickups and deliveries.

6. Drivers should be more alert. They should never leave trucks standing unlocked, or with their motors running, at coffee stops. Nor should they ever leave trailers parked beside the road.

In other words, simple common-sense precautions would make it a lot harder for today's pirates of the highways to raid successfully. END

Rail Oddities

THREE railroaders—a Westerner, a Yankee and a Southerner—were discussing their respective regions. "Out in Idaho," said the Westerner, "you can board a train and, without changing cars, travel from Cornell to Vassar, Stanford, Yale, Harvard, Princeton and Wellesley in a distance of 35 miles."

"Well," drawled the Yankee, "back in Maine, where I came from, with a few changes of cars, you can travel by rail from Calais to Dover, from Peru to Stockholm, from Paris to Lisbon and Poland to Norway."

"Aw shucks," drawled the Southerner, "that's nothing to brag about. Why, when I was a lad in Florida one could travel by railroad from Venus to Mars and Jupiter—all within a single county!"

And they all spoke the truth.—*Rock Island News Digest.*

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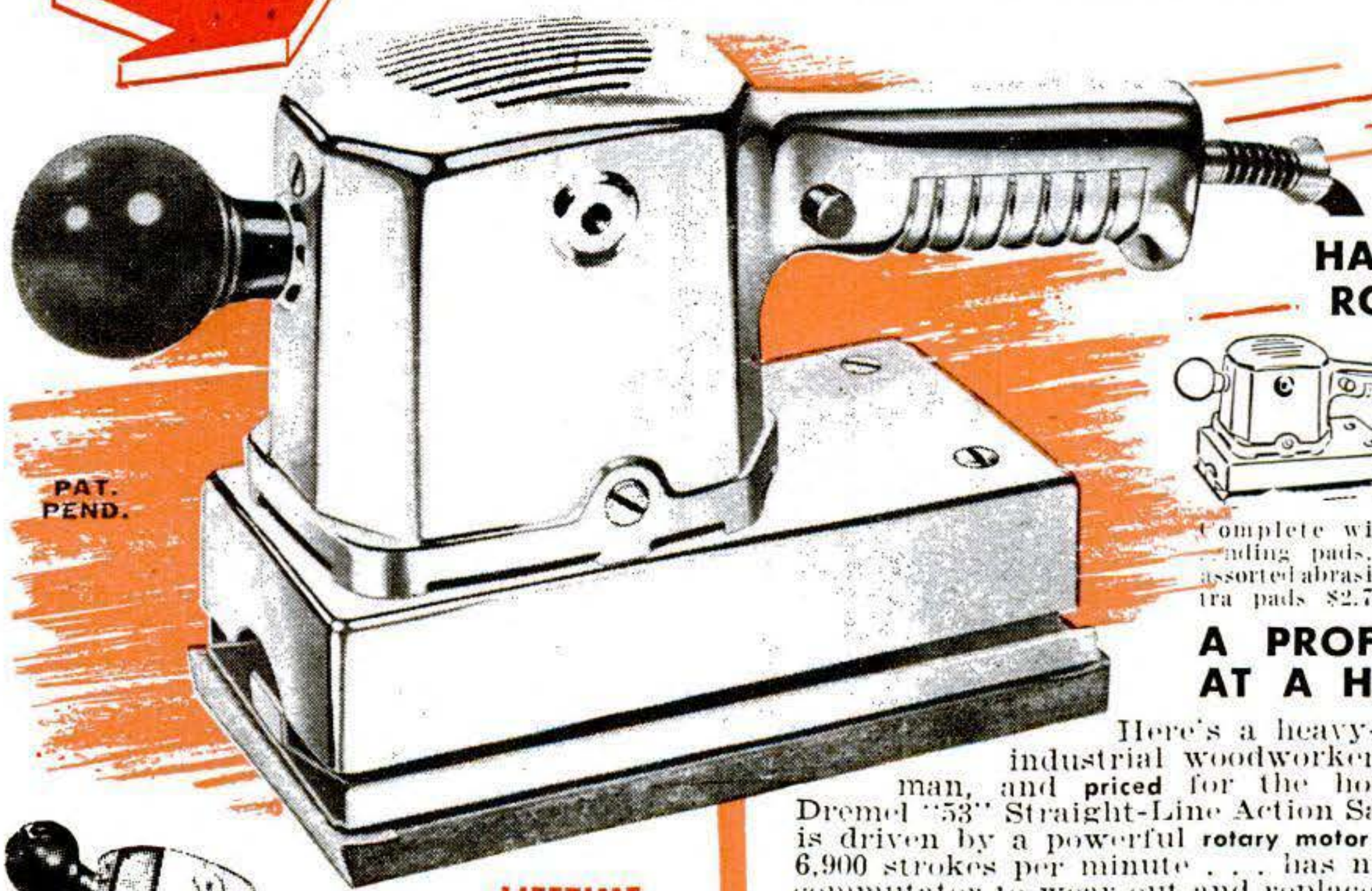
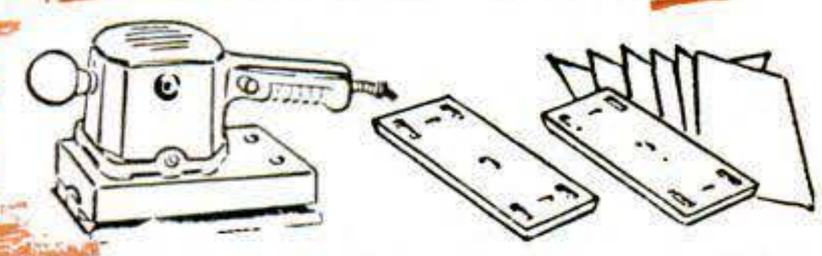
NEW DREMEL STRAIGHT-LINE ACTION SANDER

JUST IN TIME FOR CHRISTMAS GIVING!



PAT. PEND.

HAS A POWERFUL ROTARY MOTOR!

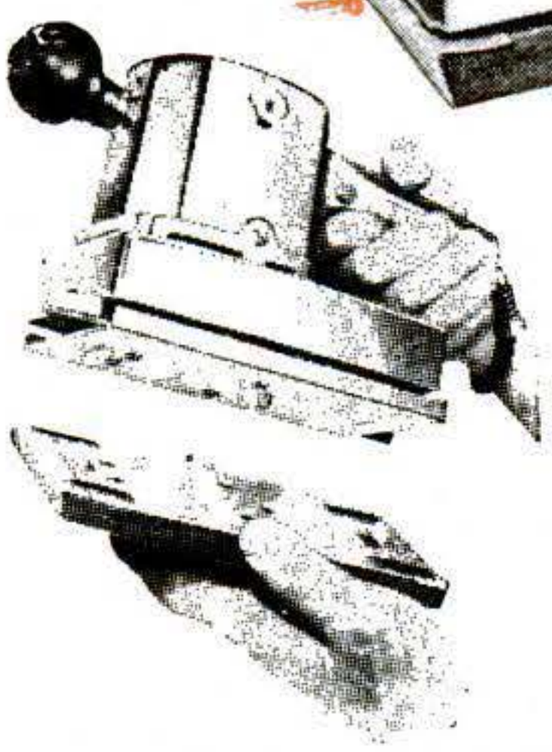


Complete with **two** sanding pads, and 6 assorted abrasives. Extra pads $2.75 each.

$34.85

A PROFESSIONAL SANDER AT A HANDYMAN'S PRICE

Here's a heavy-duty sander **built** for the industrial woodworker and professional craftsman, and **priced** for the home handyman! The **new** Dremel "53" Straight-Line Action Sander weighs only 5¼ lbs., is driven by a powerful **rotary motor** (110 V. 60 cycle AC) . . . 6,900 strokes per minute . . . has no gears, belts, brushes or commutator to wear out and replace. Dremel **Straight-Line Action** guarantees satin-smooth finishes you'll be proud to show. Detachable paper holder speeds up paper changes. Use it for WET or DRY, coarse, medium or fine sanding . . . the Dremel "53" is positively the most versatile . . . the **greatest sander value** in today's market.

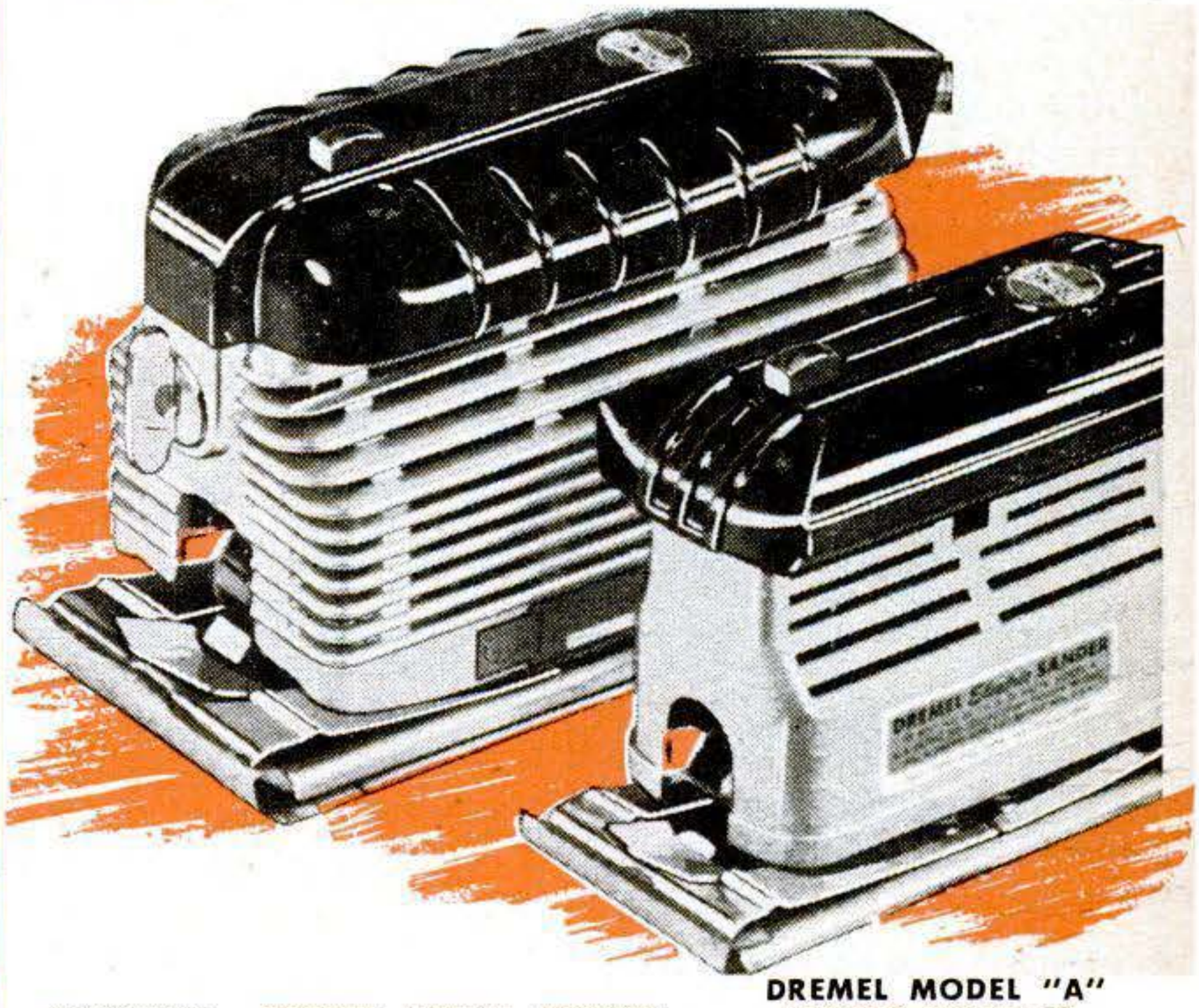


LIFETIME SEALED BALL BEARINGS

EASY ON! EASY OFF!

Unique paper holder is detachable. Grits can be switched quickly without bothersome paper change.

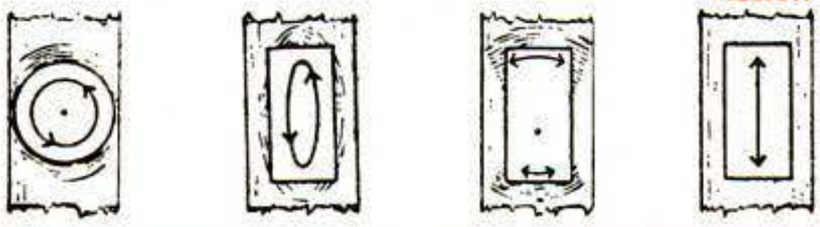
THERE'S A DREMEL SANDER FOR EVERY USE



Here's Why Craftsmen Approve . . . Use . . . Only Straight-Line Action Sanding!

Wood fibers lie with-the-grain . . . are directional. Sanding cross-grain is much like brushing a suede jacket against the nap. It leaves marks or "scratches." Sanding with-the-grain is like brushing the suede with the nap . . . leaving a velvet-smooth surface, entirely scratch-free. Shown below are four common types of sanding actions. Only **Dremel** "Straight-Line Action" sands 100% with the grain . . . Only **Dremel** can guarantee 100% scratch-free finishes.

ROTARY (cross-grain) Action	ORBITAL (cross-grain) Action	ARC (cross-grain) Action	DREMEL STRAIGHT-LINE (with-the-grain) Action



DREMEL MODEL "2000" SANDER-POLISHER

Perfect for small shop use, home repair, and workshop projects. Choice of craftsmen for fine finishing operations. Features Dremel "Straight-Line Action": 14,400 strokes per min.; 5 lb. wt., 21 sq. in. (3⅛"x7") sanding surface.

Model "2000" Sander-Polisher. 25 asst'd. abrasives, 1 polish pad in sturdy steel carrying case . . **$24.50**

DREMEL MODEL "A" SANDER-POLISHER-MASSAGER

Lighter capacity model, a favorite for general home maintenance, hobbycraft, furniture polishing, etc. Effective body massager. Features Dremel "Straight-Line Action." Wt. 2½ lbs.; 12 sq. in. (2⅝"x5⅜") sanding surface.

Model "A" Sander-Polisher Massager, 6 abrasives, 1 polish pad, 1 massage pad **$14.85**

SEE YOUR FAVORITE DEALER: Dremel Tools are sold at better dealers everywhere. If your dealer can't supply, order direct on a five-day trial, money-back guarantee. Remit in full, and we will ship postpaid. Or, send only $2.00 now, pay postman balance plus postage and C.O.D. fee.

DREMEL MANUFACTURING COMPANY, Dept. 123-L, Racine, Wisconsin

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Masonite week-end project

Now! Make your utility room more attractive. Build this laundry tub cabinet that doubles as a sorting table. It's easy—when you work with strong, smooth Masonite Tempered Presdwood®. Won't snag the finest fabrics. Not affected by water, steam or heat. Easy to cut and fit. Can be painted in attractive colors.

Free plan also tells how to make enclosure for water heater—including storage space for ironing board and laundry supplies. There are scores of ways to use these dense, grainless, all-wood hardboard panels around the home. Send coupon today.

See your local building materials dealer for
MASONITE PRESDWOOD PRODUCTS

A type and thickness for every job!

- **Standard Presdwood**—1/8", 3/16", 1/4" and 5/16" thick.
- **Tempered Presdwood**—brown. 1/8", 3/16", 1/4" and 5/16" thick. Black in all but 5/16".
- **Temprtile®**—1/8".
- **Tempered Duolux**—both sides smooth! 4-ft. and 5-ft. widths. 1/8", 3/16" and 1/4" thick.
- **Leatherwood**—1/8".
- **Panelwood**—3/16" and 1/4" thick.

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MASONITE® CORPORATION

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"Masonite" signifies that Masonite Corporation is the source of the product

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Name.....

Address.....

City.....*Zone*.....

County.....*State*.....

The Best Christmas Toys You Can Build

[*Continued from page 180*]

The blocks were sanded perfectly smooth but given no other finish at all. That way they are safe if a baby feels like chewing on them.

Each of these pieces of equipment is many playthings in one. The rocking boat is a gentle swing for tiny children: with a broom for a mast it becomes a sailing vessel; upended it is steps for toddlers to climb up and down. The sawhorses are ladders, cowboy ponies, seesaw and walking-board support. The cargo net is also a hide-out for children who crawl behind it. The possibilities are limited only by childish imagination—and that is limitless.

Children *of all ages* like this kind of play equipment. They are long-time favorites at our play schools, ones that the kids will always come back to after discarding some intricate toy that holds their interest only a short time. Don't think that older children will reject the blocks, for example. They need a bigger assortment than toddlers, and use them differently, but just as much. Where a two-year-old simply piles one on top of another, the 11-year-old becomes a builder-architect, creating whole cities complete with skyscrapers, bridges, even statues. The same is true of the cargo net: the older child just climbs higher and faster than the younger one.

Child's Way of Learning

But perhaps the real reason these are good for home play is that they are toys a child needs. Play equipment plus supplementary toys are not luxuries but necessities of childhood.

Play is simply a child's way of learning. Babies must learn to pick things up. Teen-agers must learn to use their ingenuity and creative ability. And good toys and equipment are merely tools for them to learn with. Lacking these special tools, children will improvise—not always to suit their parents. If there is no climbing ladder handy, they will still climb and jump—probably on the piano. END

A Challenge

IF YOU think old soldiers just fade away, try getting into your old Army uniform.—*The Columbian Crew.*

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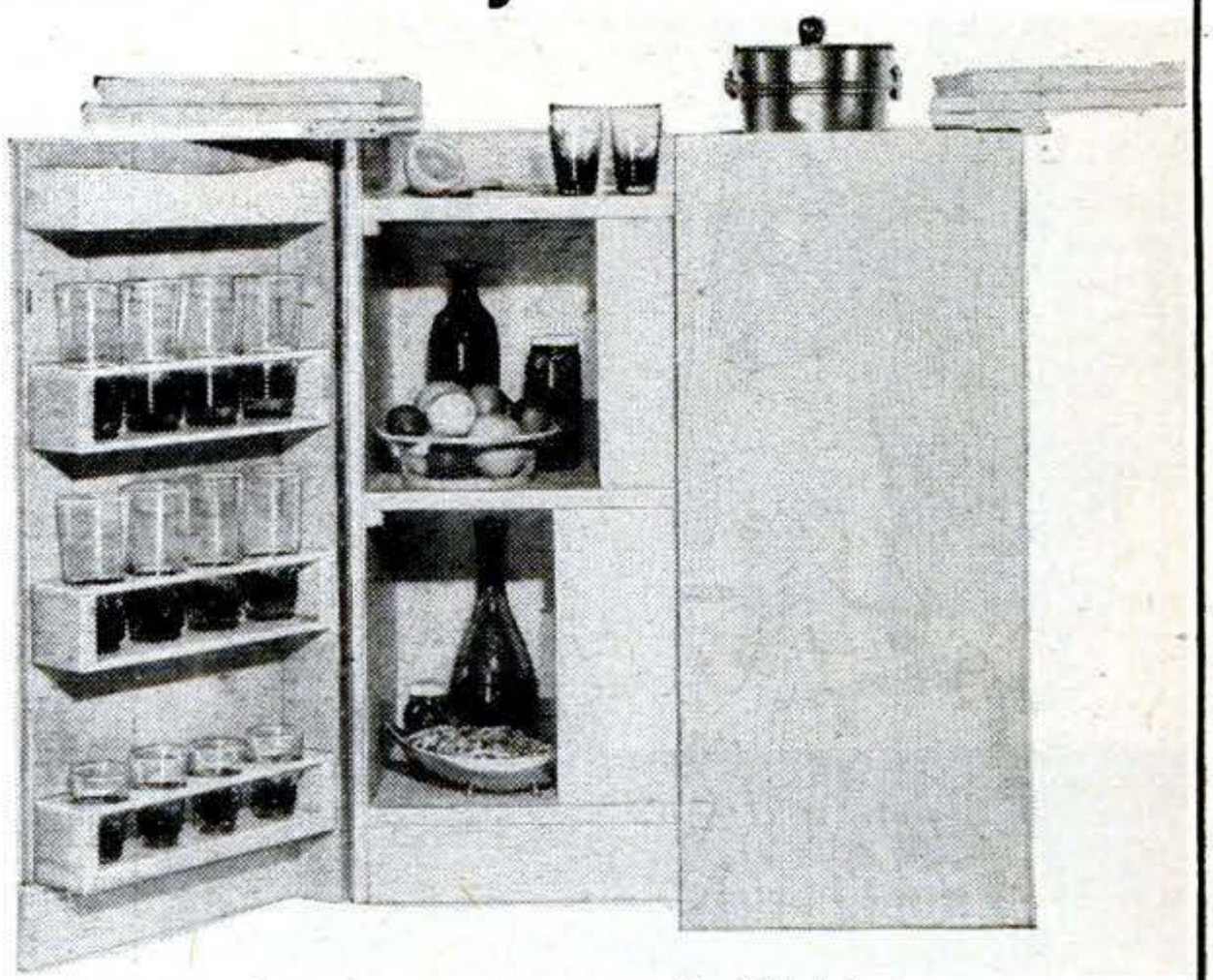
Be the Perfect Host with this Easy-to-Build Bar

Picture this attractive, roomy, movable cabinet-bar of beautiful Weldwood birch in your home. Makes hosting a pleasure. And you can build it yourself very simply from Easi-Bild Pattern No. 189.

Plans show every step, every detail of construction. All you do is order the list of materials specified on the envelope, follow the simple directions and assemble. Easi-Bild patterns and beautiful Weldwood paneling are both available at your lumber dealer.

If you prefer, send 35¢ in cash or money-order for Easi-Bild* Pattern No. 189. Send 35¢ additional for 36-page pattern catalogue illustrating over 180 other pattern projects.



Any weekend carpenter can build this bar at a fraction of what it would cost ready-made

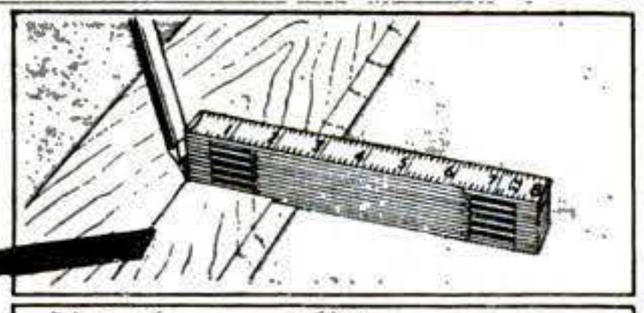
UNITED STATES PLYWOOD CORPORATION

World's Largest Plywood Organization

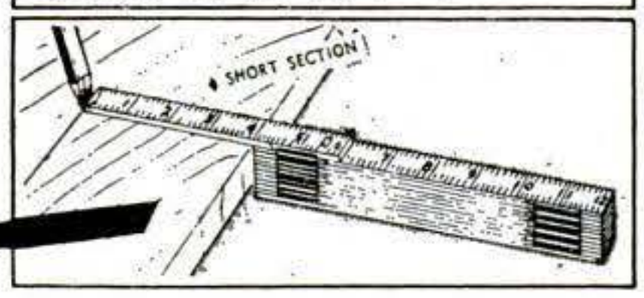
Pattern Department, P.O. Box 215, Pleasantville, N. Y.

*T.M. Reg.

TAKES BUTT END MEASUREMENTS AT 2, 4, & 6 INCH INTERVALS



CAN BE USED AS A MARKING GAGE



New LUFKIN No. 466 BUTT SPACING RULE

Unique 4 inch first end section permits taking measurements or using as a marking gage at any even numbered interval. Ideal for 12", 16", 24" centers. Has all the famous Lufkin RED END features.

BUY LUFKIN TAPES • RULES • PRECISION TOOLS AT YOUR HARDWARE OR TOOL STORE

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THE AMAZING STORY OF MEASUREMENT

LUFKIN RULE CO., Dept. PS, Saginaw, Mich.

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How You'll Get TV Colorcasts

[*Continued from page 121*]

the face of your tube. That's where your set goes to work.

What happens in the set?

Your color tube will have phosphors on its inner face. They're the same things that fluoresce to create a black-and-white picture. But the color-tube phosphors will produce the "primary" colors of red, blue and green. Mix them, and you can create any color you want.

The three phosphors carrying the individual colors are arranged in little triangular clusters. On present color tubes there are about 600,000 phosphor dots in 200,000 clusters.

In your color set will be three electron guns, one for each primary color. Your present set has only one gun. Each gun shoots its appropriate dot in the cluster. The dots light up and create color.

What makes color guns so accurate?

A baffle plate or shadow mask is interposed between the gun and the face of the tube. It's full of tiny holes. A gun can shoot its particular color because it's forced to make "angle shots" through the holes in the plate. Each color in each cluster is lined up neatly to receive a shot from only one precise direction.

But how do you get a mixed color, say a reddish-purple?

The viewing camera has three image orthicon sensing tubes, one for each color. They are excited exactly in proportion to the primary colors in the light presented to them through the camera lens. Purple is a mixture of red and blue. For reddish-purple, the red tube experiences full excitement, the blue not so much. In your receiving set, the electron guns are excited in proportion to the signals supplied by the camera tubes. So the red in the phosphors fluoresces brightly, the blue not so much. Reddish-purple results on your screen. The eye merges the small dots and sees them as mixed colors.

[*Continued on page 268*]

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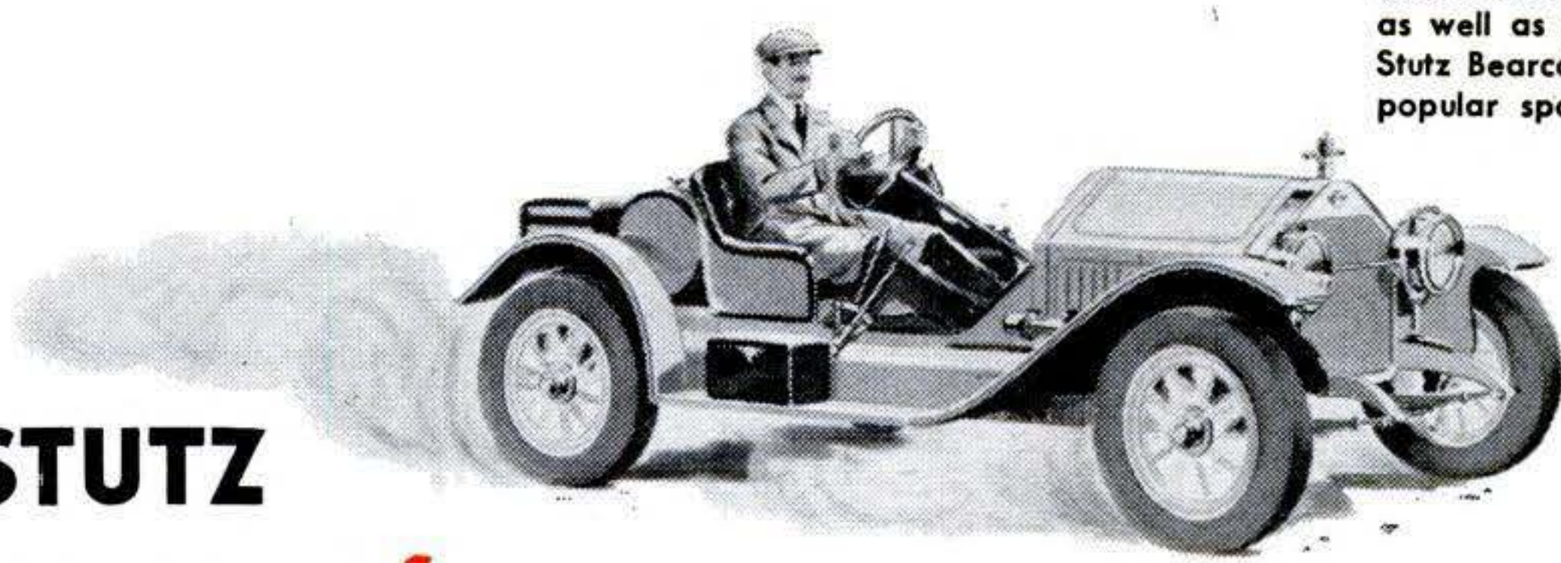

Renowned for speedy appearance as well as performance, this 1915 Stutz Bearcat was one of the most popular sport models of its day.

From STUTZ Bearcat

To BUICK Wildcat

ACs Have Been Factory Equipment On Nearly as Many New Cars as All Other Makes Combined

The smooth-flowing design of the Buick Wildcat is matched by the equally smooth-flowing power of its Fireball V-8 engine.

Quite a contrast in their contours—but they're both distinguished for their design, and their AC-sparked performance.

AC Spark Plugs provide superior performance because they have today's best spark plug insulators—patented *CORALOX*.

CORALOX resists, to a far greater degree than any previous insulator, the formation of oxide and carbon deposits which cause "shorting" and intermittent missing—

- **ROBBING ENGINES OF AS MUCH AS 10% OF THEIR POWER**
- **WASTING GASOLINE BY AS MUCH AS ONE GALLON IN TEN**

No matter what make or model car you drive—for the "payoff" in power, performance and economy, get a new set of ACs.

AC SPARK PLUGS

PATENTED *CORALOX* INSULATOR

AC SPARK PLUG DIVISION GM GENERAL MOTORS GENERAL MOTORS CORPORATION

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HAPPY HOLIDAY . . . AND YEAR ROUND PLEASURE

PLUMB®

HAMMERS • HATCHETS • AXES • FILES

How You'll Get TV Colorcasts

[Continued from page 266]

How long do phosphors stay lighted?

Less than a tiny fraction of the time it takes you to blink.

Then the guns keep shooting them?

Yes, the whole batch, 30 times a second.

Are the phosphors shot line-by-line?

No, every other line is skipped. When the guns retrace, they shoot the lines they missed on the previous trip.

What kind of programs will color be on?

Name it yourself and you'll probably hit it. The musical extravaganza shows—NBC's Show of Shows and the Lucky Strike Hit Parade, for instance. They're talking about doing colorcasts from the Grand Canyon and Santa Catalina Island's submarine gardens. Fashion shows will be a color must. So will flower shows and those cooking-school daytime shows for the housewife where the camera focuses on yellow egg yolks, green peppers, red paprika, orange-ice desserts and golden-brown roast duck.

Will colorcasts be on film or "live"?

Live, probably. Color movie film is four times as expensive as black-and-white and costs four times as much to process.

Will there be reception interference?

Possibly, here and there. Color signals are slightly more susceptible to interference than black-and-white ones.

Is RCA Victor the only company that will make color sets?

No, most of the other companies are now licensed to make color sets.

Will all the networks carry colorcasts?

Ultimately, yes.

They were working on color TV five years ago. What's held it up?

[Continued on page 270]

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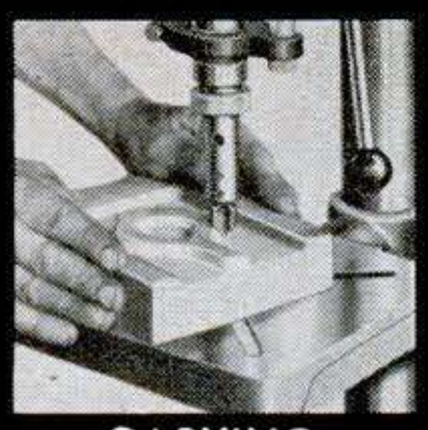
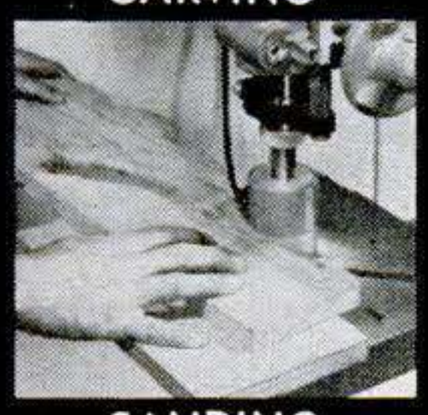
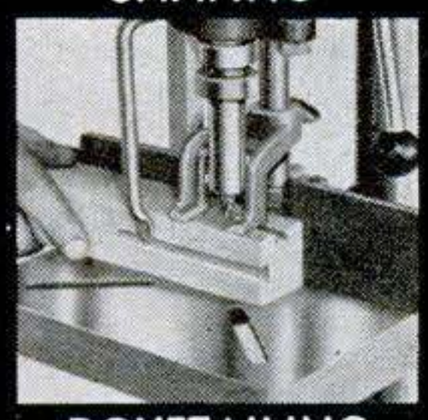


CARVING



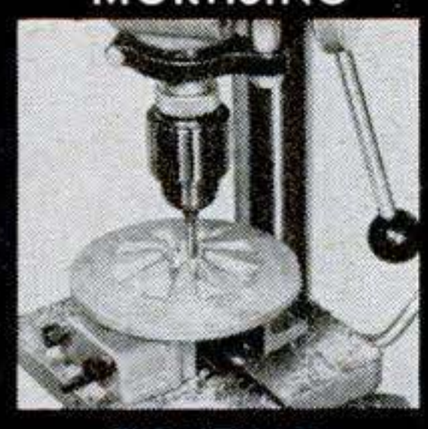
SANDING

SHAPING



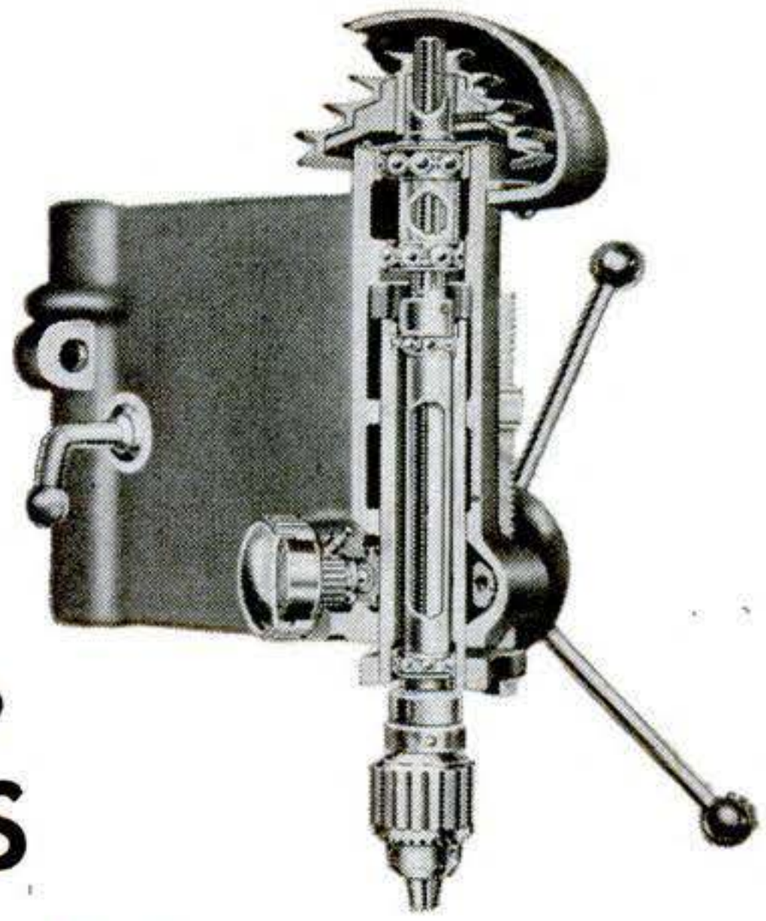
DOVETAILING

MORTISING



ROUTING

you can DO so much MORE so much BETTER with an *Atlas* 15" DRILL PRESS



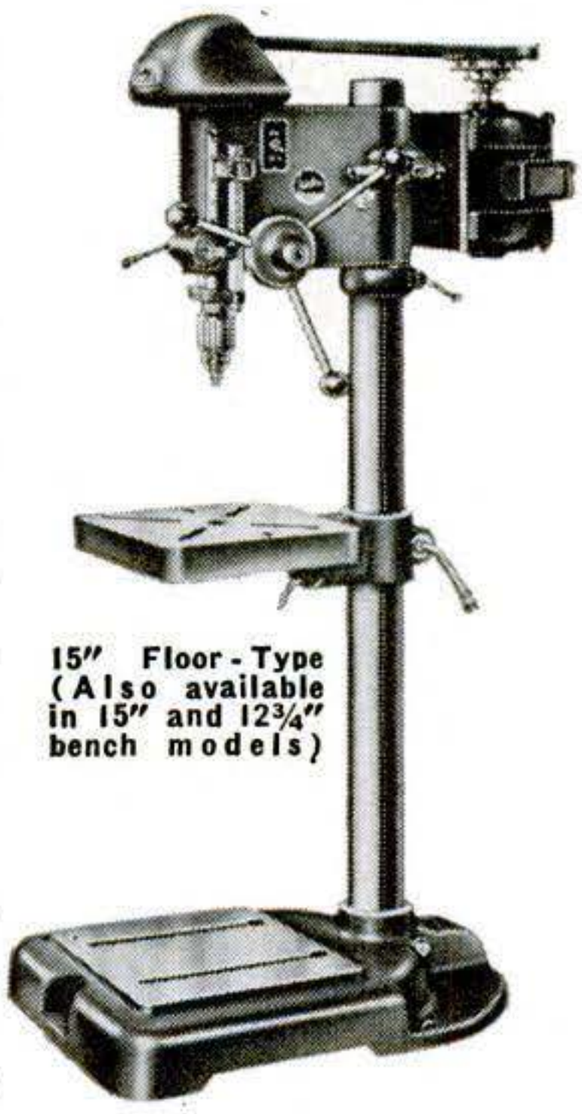
AMERICA'S FINEST
Cross section of the massive drill head shows exclusive ATLAS floating drive, sealed-for-life ball bearings and precision ground spindle and quill.

If all drill presses in the price range of the ATLAS Model 1060 were lined up for your inspection, your choice would be easy. On a comparative basis the 15" ATLAS is a standout value. The head is almost twice as heavy, and this, with the balanced overall design, assures maximum accuracy and rigidity. And if you compared performance, the ATLAS would earn your overwhelming preference. Built to strictest industrial standards for actual production use, the 15" ATLAS costs no more than ordinary drill presses. Send coupon or postcard for full information.

DON'T BE IN A HURRY...

Investigate Before You Invest! Be Sure Your Drill Press Has These Important Features!

1. Biggest, heaviest head with the widest spaced column bearings for maximum accuracy and rigidity. Remember, *the head is the heart of the drill press.*
2. Table, column, and base are of heavy-duty industrial weight for more accurate work and really *s-m-o-o-t-h* performance. Balanced design throughout.
3. Exclusive floating drive with six splined spindle and drive sleeve for maximum accuracy.
4. Four widely spaced sealed-for-life ball bearings . . . two on drive sleeve, two on spindle . . . provide greater accuracy, smoother, quieter operation, longer service life.
5. Exclusive neoprene quill stop bumper assures shock-proof return . . . lengthens tool life.
6. Machine ground table may be tilted to any angle, right or left.
7. 41" work capacity over table, 46" over base. Handles bigger jobs.
8. Quick-positioning, direct-reading Vernier depth control stop . . . saves setup time.
9. Built-in switch, coordinate clamp locks, column collar, adjustable feed tension, 3-spoke feed wheel (all furnished) . . . combine to give better control.



15" Floor-Type (Also available in 15" and 12¾" bench models)

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☐ Enclosed is _____ for ☐ 20 PLAN BOOK 50c
(65c outside U.S.A.) ☐ 18 PLAN BOOK 50c

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with these low cost, practical
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1. 20 PLAN BOOK — Original furniture designs by noted authority.
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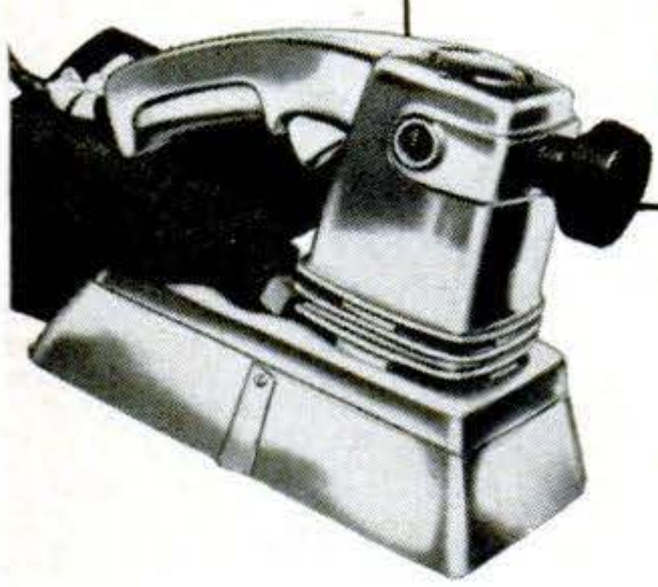
NEW Dustless Finishing Sander

Now . . . sand in your home without messing!



Porter-Cable
Model 127
ONLY
$59.50

Porter-Cable's new Dustless Finishing Sander snuffs up 91% of the dust . . . prevents it from drifting about the house. Keeps cellar workshops clean. Eliminates the usual mess when doing inside repairs and remodeling. Lets you work on hobbies, refinish furniture, right in your living quarters.

Ideal for cabinet work

Super-fast—Super-smooth

Outspeeds hand sanding 10 to 1 — actually surpasses it for fine finishing. Abrasive pad rotates at high speed in ¼" orbits. Won't scar or mar. Flat surfaces are made satin smooth. Plywood is edged or rounded without chipping. Butt joints and inlays are polish-sanded with no hatch marks. On drywall joints and plaster patches, you're no longer exposed to the annoying, choking dust.

Keeps dust off work

Important Features

Motor-driven for long, hard usage, AC/DC—4,000 RPM *under load.* Gearless drive — no troublesome operation, no expensive repairs. Patented paper clamp — keeps abrasive smooth and tight. Light — weighs only 6 lbs. Oversized dust bag available at extra cost.

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Send me description and uses of new Dustless Finishing Sander...also name of my nearest dealer.

Name.....

Address.....

City.....County.....State.....

Manufacturers of SPEEDMATIC and GUILD Electric Tools

How You'll Get TV Colorcasts

[*Continued from page 268*]

The fact is, they were working hard on color TV before World War II. The sheer magnitude of the job of perfecting it caused the delay. An argument in the industry and the FCC over compatible and incompatible systems added to it.

Will I be able to get black-and-white reception on my color set?

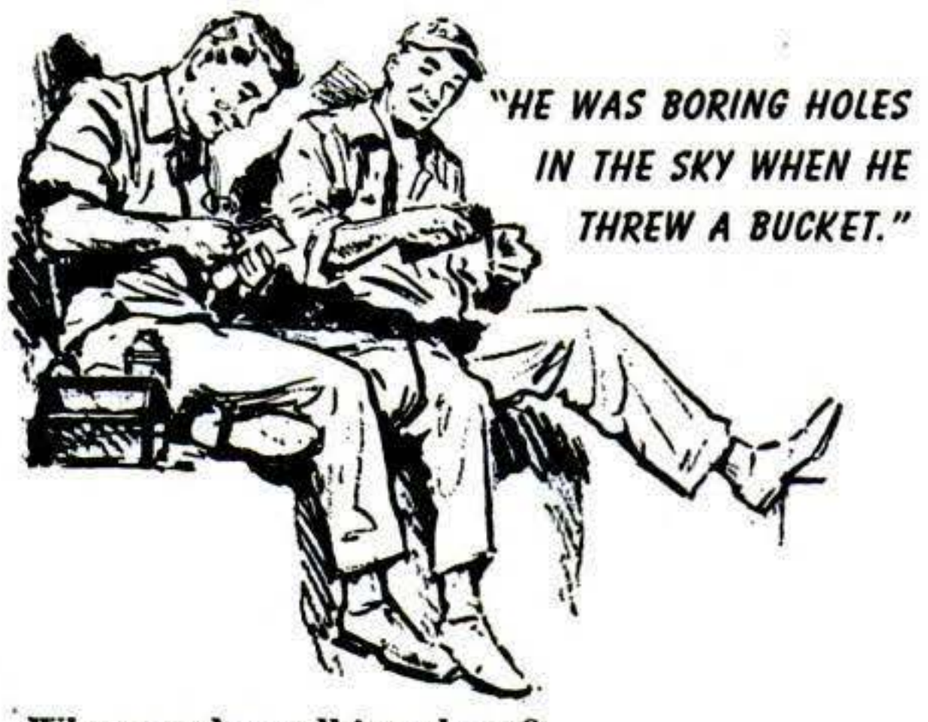
Yes.

When the man comes around to install my color set, what should I know about the quality of the picture?

Your color image will depend on three elements: *Brightness* is the over-all intensity of the picture. It's the only attribute of color shared also by neutral or gray tints, such as those on your present set. *Hue* is the distinction between redness, yellowness, greenness and so on. *Saturation* is what makes the eye separate strong colors from pale ones of the same hue—as red from pink.

Your serviceman will also check the definition and resolution of your color picture. *Definition* means how sharp the image is. *Resolution* means how small an object you can see clearly. END

Shoptalk:



What are they talking about?
Where do they work? Answer below.

They're mechanics at an Air Force Base. The speaker is telling about a jet pilot who was just cruising to burn up fuel (boring holes in the sky) when the jet engine lost a turbine blade (threw a bucket).

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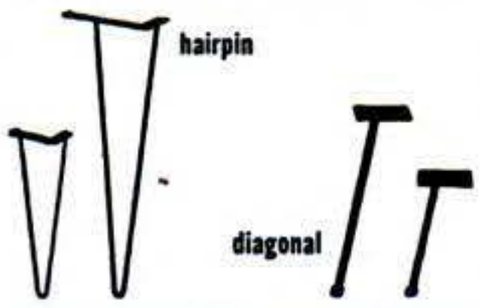
SAVE 50% DESIGN AND BUILD YOUR OWN MODERN FURNITURE

TWO STYLES OF METAL LEGS



HANDSOME WROUGHT IRON LEGS

Simply attach with a screwdriver to flush door, plywood, etc. Make tables, couches, benches, modernize old and unpainted furniture. RUST-RESISTANT, matte black finish. All screws included. Postpaid.

PRICES ARE FOR SET OF 4 LEGS

Height Leg	HAIRPIN Specify 3/8" or 1/2" Rd.	DIAGONAL 5/8" Rd.
6"	$ 5.55	$5.25
9"	5.75	5.45
12"	5.95	5.65
14"	6.65	5.85
16"	6.95	5.95
19"	7.95	6.75
22"	8.95	
28"	13.45	12.00

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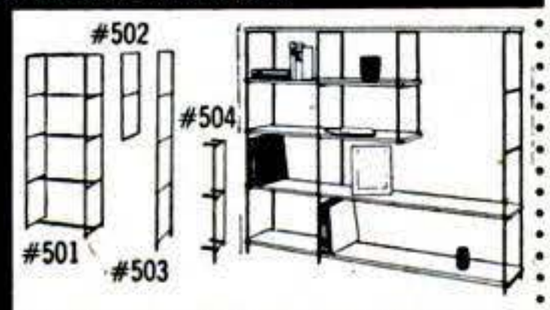
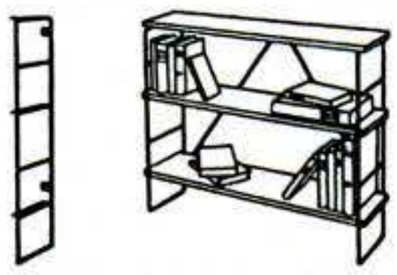
ROOM DIVIDERS

The latest decorating idea. Make any shape room divider, bookcase, album rack, etc., using combinations of four units and 1" x 12" boards #501—59" high, $18.95; #502—27" high, $4.25; #503—59" high, $7.95; #504—32½" high, $4.95 Express charges collect



BUILD BOOKCASES ANY LENGTH

Smart sturdy wrought iron frames. Painted and rust-resistant. Make your own bookcases to stand or hang on the wall by adding 1" x 10" boards from your local lumber yard. All screws and braces included. Single frames $4.50 each. $8.95 per pair postpaid.



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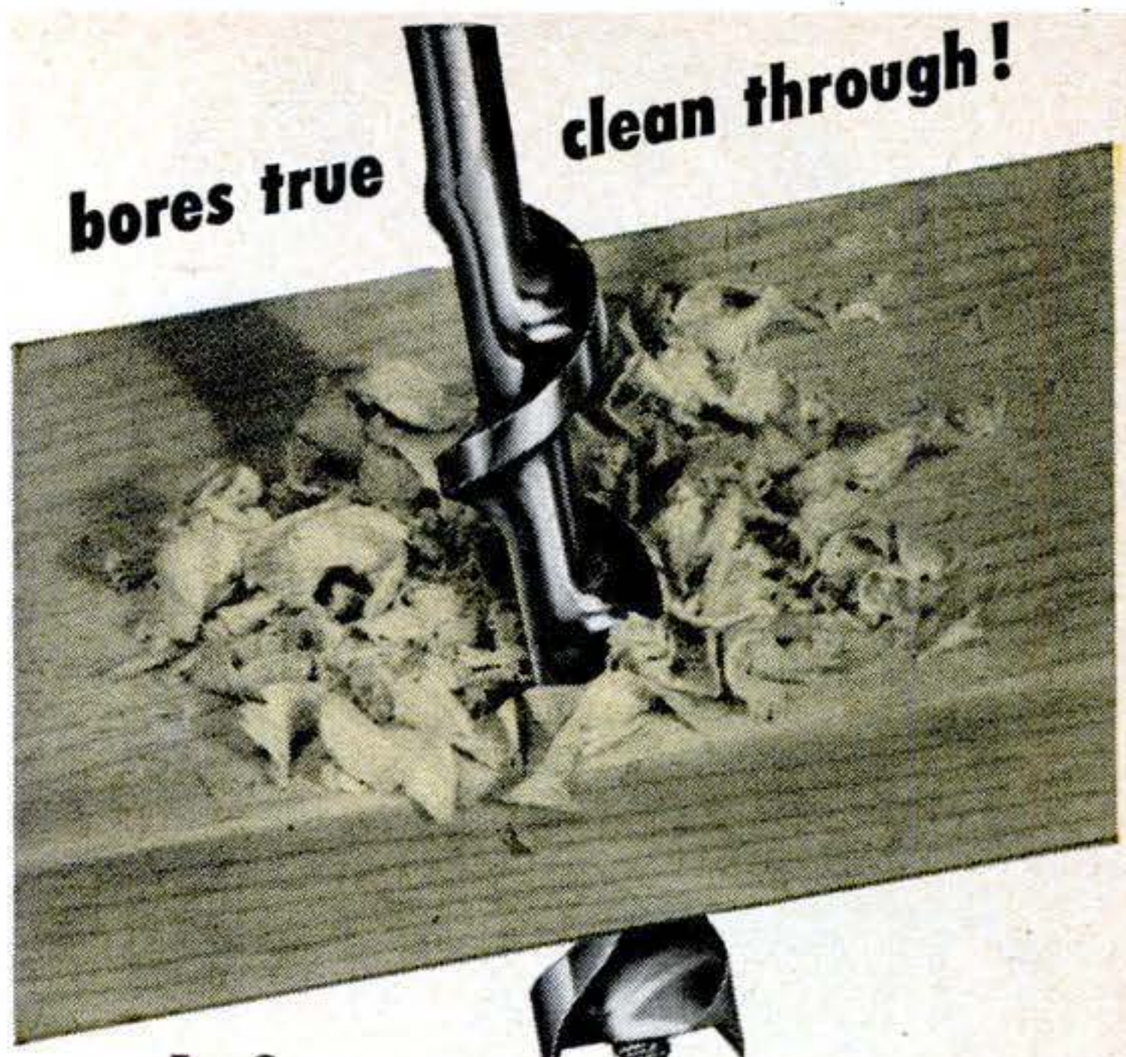

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World's finest wood-boring tools

Irwin Auger Bits make any boring job easier. They're precision made of special bit steel — heat-treated, tempered, hardened full length for longer life. Cutting heads stay sharp job after job. Original solid center design adds extra strength for steadier, cleaner, more accurate cuts. No binding, no clogging. *Ask for Irwin* at your independent hardware dealer — the auger bit that bores true . . . clean through.

IRWIN 62T Solid Center Auger Bit — sizes 1/4" to 1 1/2". Double cutter head. Open throat for quick chip clearance. No binding, no chewed edges.

IRWIN All-Purpose Expansive Bits — two types, small and large sizes. Boring range 5/8" to 3". Accurate, easily adjusted. Two cutters with each bit. Individually packaged.

IRWIN Bit Sets — in hardwood box or plastic rolls. 6, 10 or 13 bit assortments. Sizes 1/4" to 1". Ideal gift for handyman or professional.

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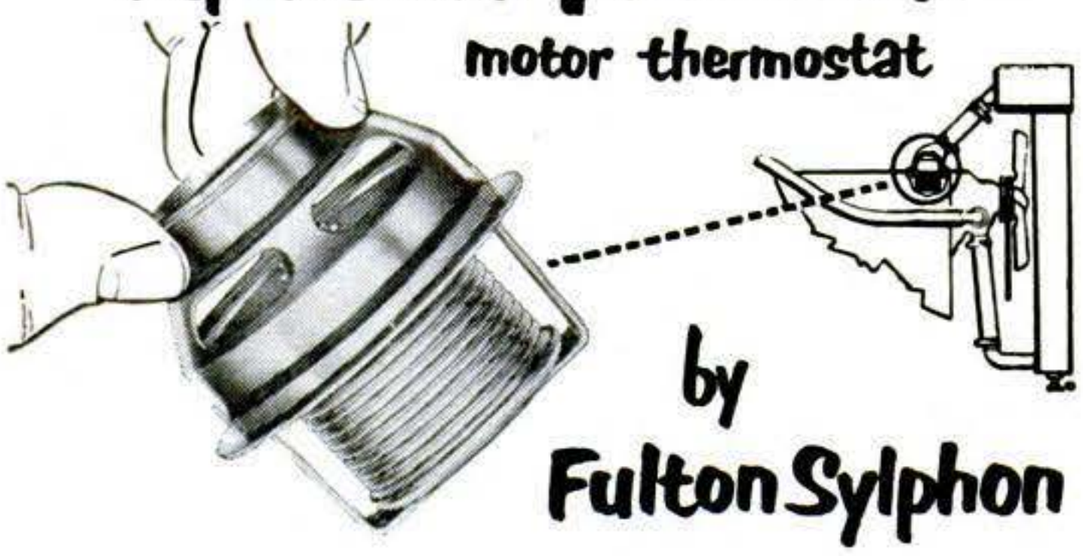
This WINTER

CHECK YOUR MOTOR THERMOSTAT

A heater that fails to keep your car comfortably warm is often the result of a dirty, damaged or over-age thermostat that prevents the engine from warming up properly. A faulty thermostat can also cause the engine to over-heat and boil away anti-freeze. In either case, the result is a costly waste of gas and oil.

You can easily remedy this wasteful condition. Get your service man to check the motor thermostat. And if a new one is needed —

Replace with Autostat® motor thermostat



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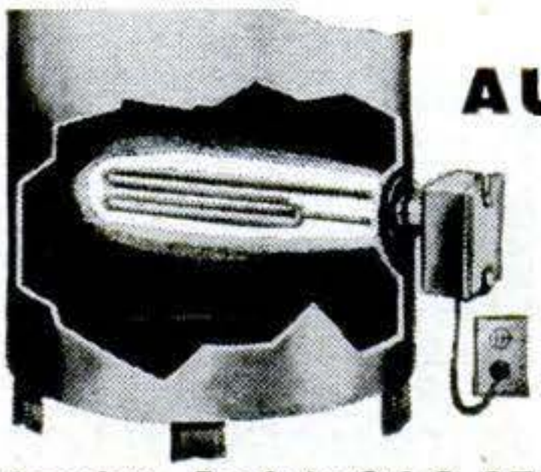

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ITEM #65 For Stationary or Portable Use. HEAVY DUTY RANGE to 250 AMPS. New 'Magic Terminal' for Low Current 30 to 100 Amps.

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- **Available with Either Flat Belt or Double V Pulley**
- **Complete Operating Instructions**

Shipping weight 107 lbs. $350.00 Value. F.O.B. Chicago..... **119.50**

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MANY SIZES FROM 350 WATTS TO 25 KVA

ITEM #183

Item #183—3000 to 4000 Watt Generator Set

FEATURES—Power for your home or business. Simply connect to power panel or house circuit. ● Constant voltage regardless of load. ● Push button start or stop. ● Easily made full automatic start or stop. **SPECIFICATIONS**—Sizes 19"x30"x48". Steel skids, weatherproof housing, requires no building. Wt. 725 lbs. ● Hercules 4-cyl. 10 HP gasoline engine. Load governor. Oil filter. Quiet muffler. 6-volt starter, generator. ● Hobart 115 volt, 60 cycle, 3000 to 4000-watt generator. Furnishes either single or three-phase power, 2 or 3 wire. ● Panel contains oil gauge, voltmeter, ammeter, circuit breaker, voltage regulator, start button. Today's cost over $1200.00. SALE PRICE. F.O.B. Chicago..... **465.00**

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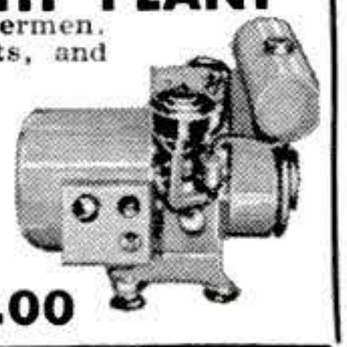

ITEM #178—For hunters, campers, fishermen. Lightweight portable power for radios, lights, and small electrical appliances. 350 Watt—110 Volt—60 Cycle A.C. Model MS-35-3, made by Midco Mfg. Co. 1 cylinder, 4 cycle engine complete with muffler, starting rope and oil bath air cleaner, direct coupled to a 350 watt generator with voltage control rheostat and twin outlets. Engine speed 1800 R.P.M. Shipping weight 116 lbs. F.O.B. Chicago..... **89.00**

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2 TON, 6-WHEEL HYDRAULIC LIFT TRAILERS

USE FOR: Conveyor ramp ● Boat trailer ● Lumber ● Pipe ● Pole trailer ● Machinery trailer ● Hydraulic dump for grain wagon ● Coal truck ● Lift Truck ● Variable height hydraulic work table ● Removable rack permits use of hydraulic lift for other installations.

Item #356

Outstanding features of these Trailers are:—4000 lbs. payload. 2 individual hydraulic lifts complete with hand pumps & valves. 6—18"x5.5 pneumatic tires. Manual screw-down brakes. Ball-bearing axles. V-shape load rack—8' long. Towing tongue. 54" lift. Wheelbase 98". Ground clearance—4½". Tread width—52". Overall width—58". Overall length including drawbar—167". Gov't. Cost $685.00. Ship. wt. 1400 lbs. F.O.B. Chicago..... **169.50**

Use the adjustable height load rack for boats, lumber, poles or pipe. By adding a plate, you have a ramp adjustable to freight car or truck body height. Add a grain wagon body to the frame for a perfect self-contained hydraulic dump wagon. Mount work-in-process on trailers, permitting adjustment of work height for maximum efficiency. Easy launching and recovery of boats from sloping beaches is done by hydraulically raising and lowering either end of load rack.

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Use for air compressors, surge tanks, CO-2 tanks, liquid containers, floats, buoys. 24" long—4" diameter—½" pipe thread port. Ship. Wt. 10 lbs. F.O.B. Chicago..... **2.50**

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Item #224—3¼" bore, 24" stroke, will lift 8250 lbs. with 1000 P.S.I. line pressure. ½" pipe thread ports—1⅜" stressproof ground, polished and plated—solid steel shaft. Overall length closed 36". ¼" steel wall cylinder barrel, clevis mounting at base and shaft. Features—Tie Rod construction. Honed barrel. Ship. wt. 50 lbs. F.O.B. Chicago.... **39.60**

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Especially designed for belt drive from fan belt, power take-off, drive pulley, electric motor or small gas engine. Equally suitable for direct coupling. Pedestal type mounting with two bolt holes for ⅜" hold-down bolts. Standard ½" pipe thread inlet and outlet ports. Delivers 4.5 GPM at 1000 PSI at 2800 RPM with 3 HP. Will actuate one item #6, 3" bore, 24" stroke cylinder in 10 seconds. Hardened steel gears turn in dense oilite bronze bearings. Rotation—clockwise facing shaft. Guaranteed trouble-free service. Ship. wt. 6 lbs. F.O.B. Chicago..... **22.50**

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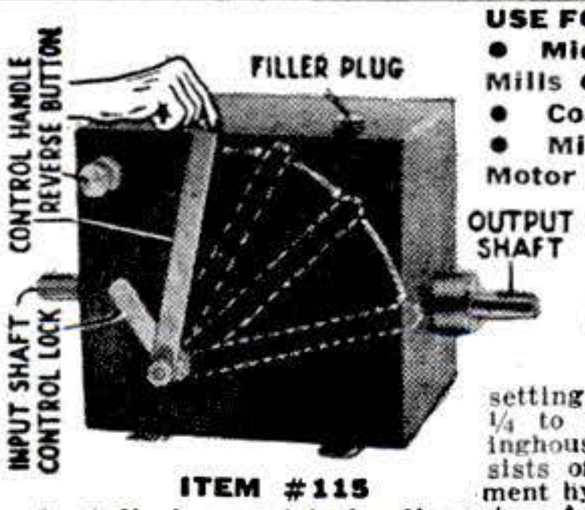

ITEM #115

USE FOR: ● Reamer Drives ● Midget Cars ● Feed Mills ● Canning Machines ● Conveyors ● Lathes ● Milling Machines ● Motor Boats ● Cream Separators ● Garden Tractors ● Pumps

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of ¼ to 1½ H.P. This Westinghouse-Oil Gear Unit consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Shafts measure ⅝" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 750 R.P.M. Over-all dimensions, 7½"x7½"x11½". Gov't acquisition cost $428.00. Ship. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago..... **54.50**

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ITEM #355—2½" bore and 7½" stroke, 1½" stainless steel piston rod. Lift capacity 5000 lbs., using 1000 lbs. pump pressure. Manufactured by Delco Remy Division of General Motors Corporation. Clevis mounting on base and piston rod for 7/16" bolt. Overall length closed 21". Distance between centers 19". Supplied with fittings to ⅜" pipe thread. Brand new—in original carton. F.O.B. Chicago **16.00**

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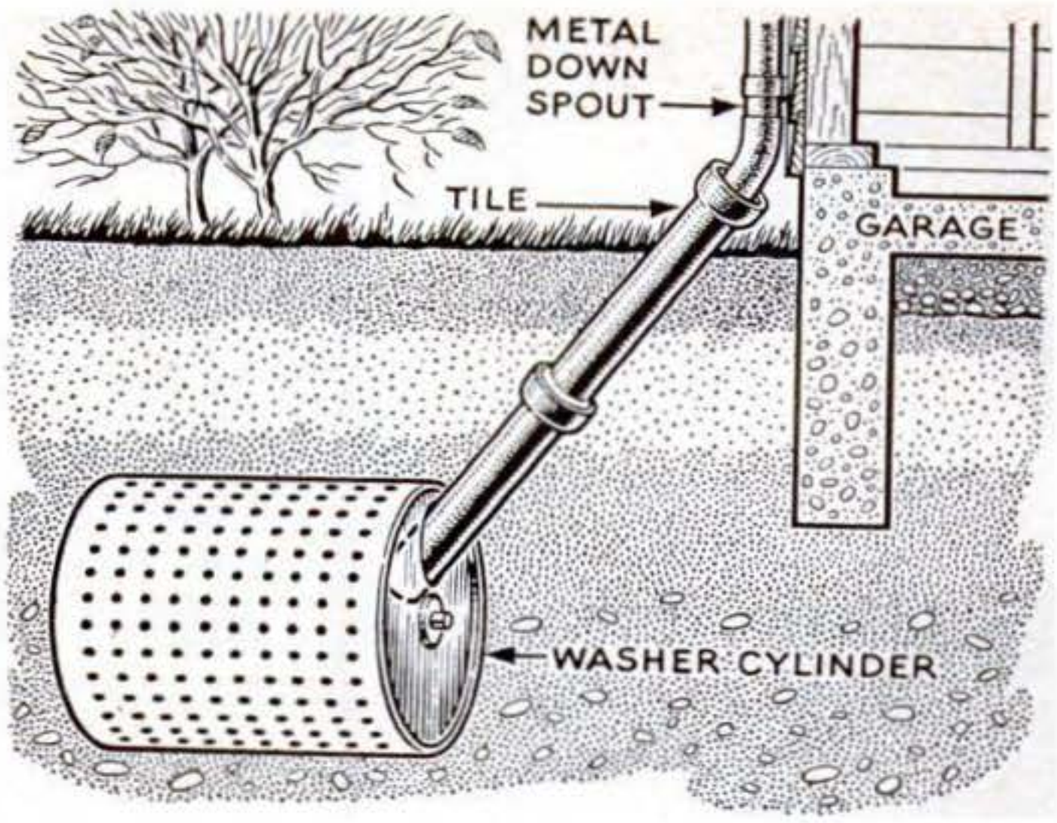

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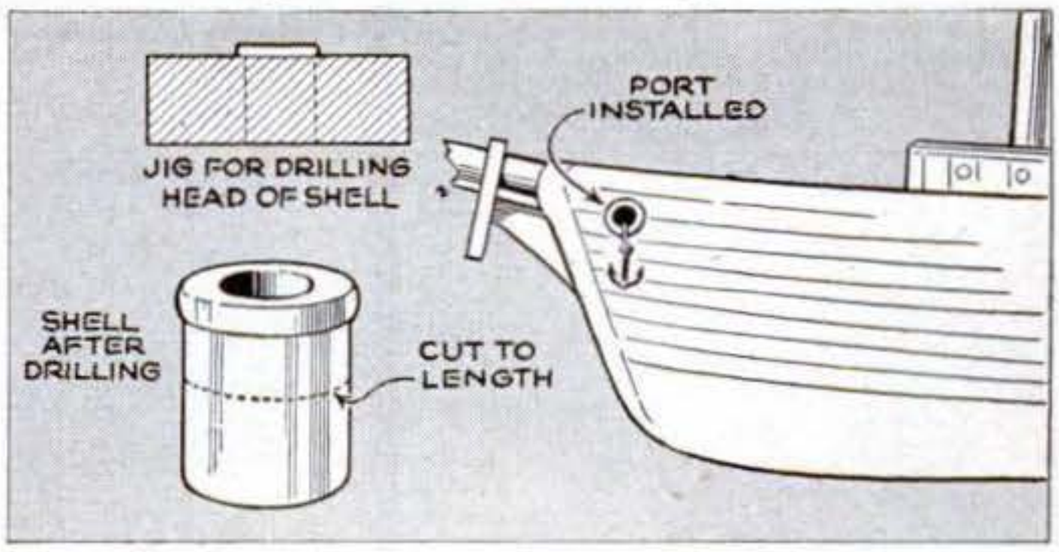

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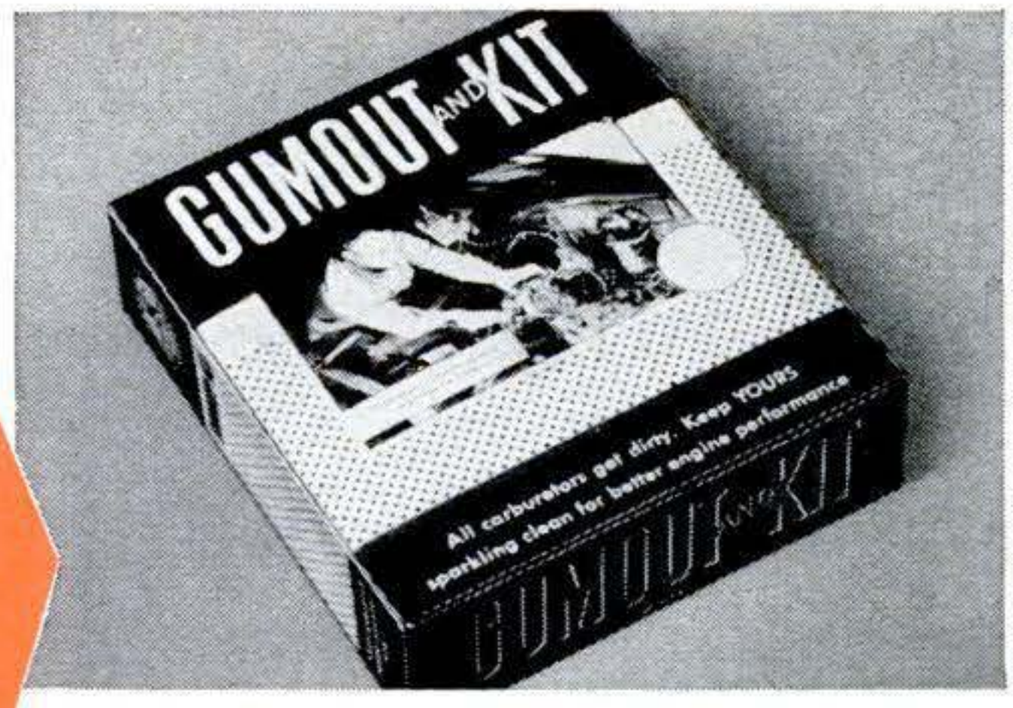

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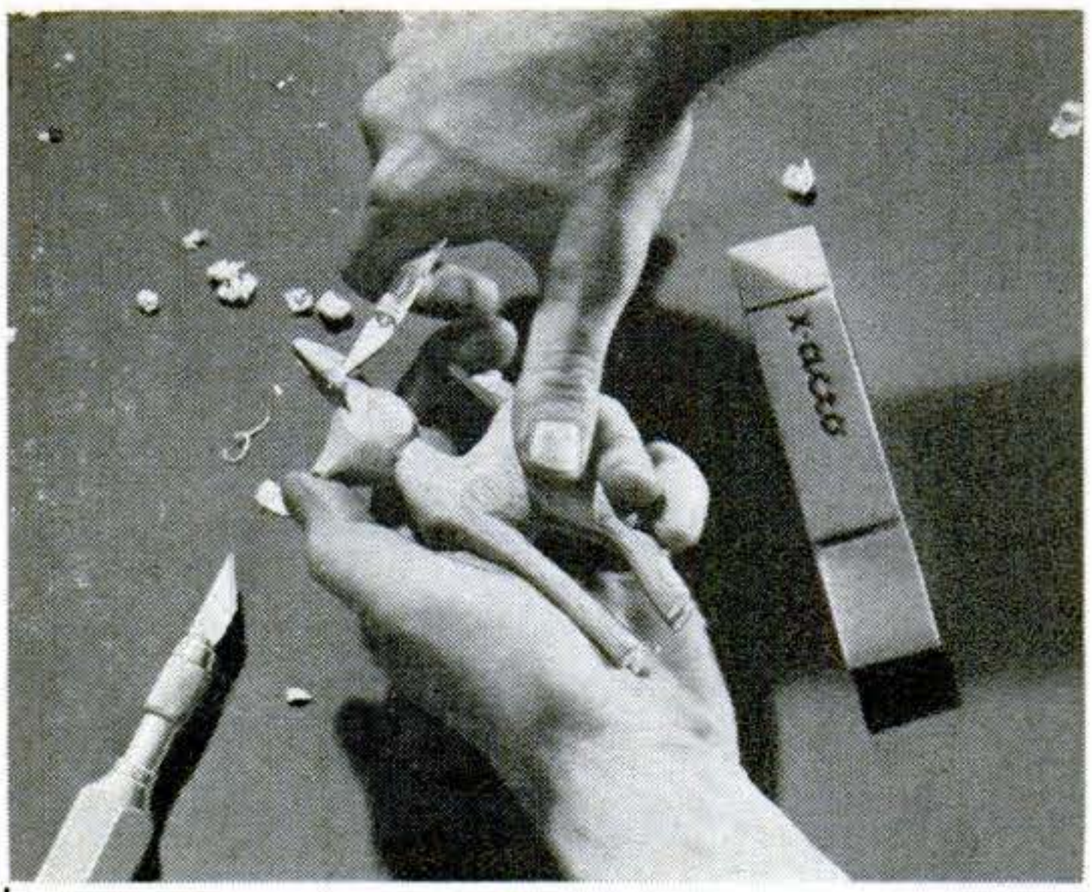

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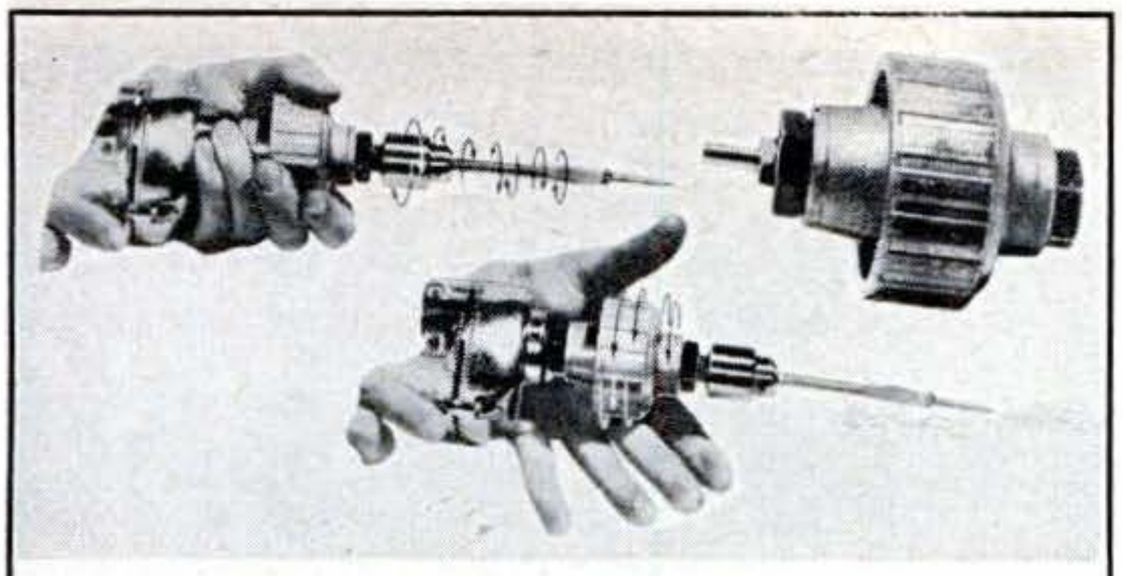

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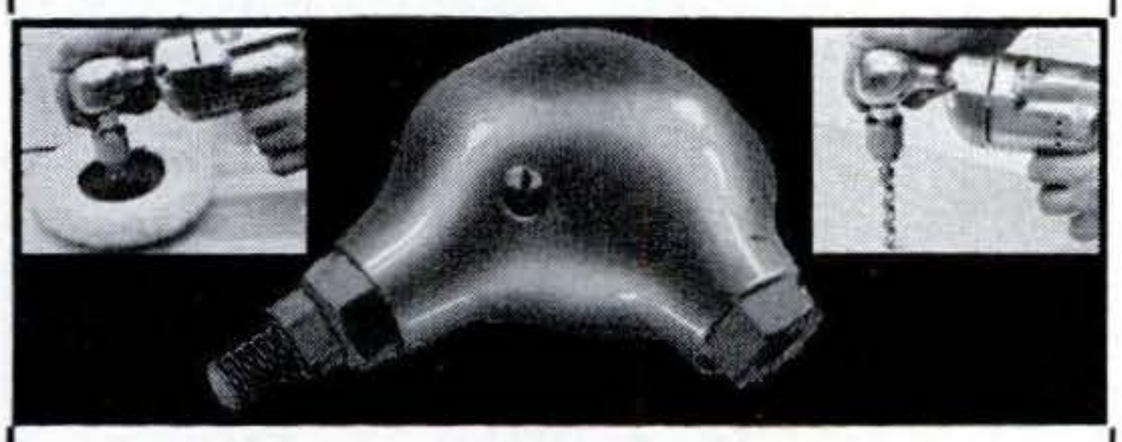

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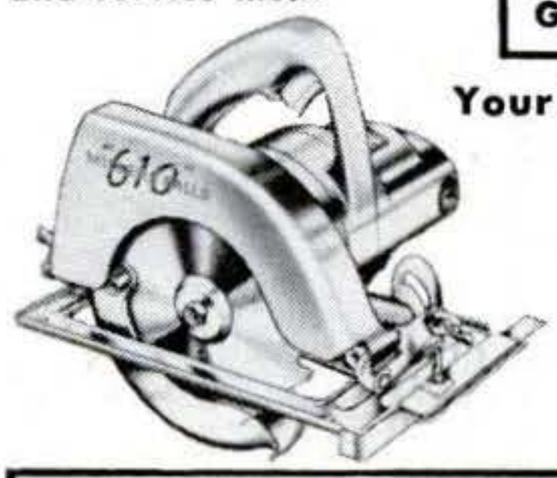

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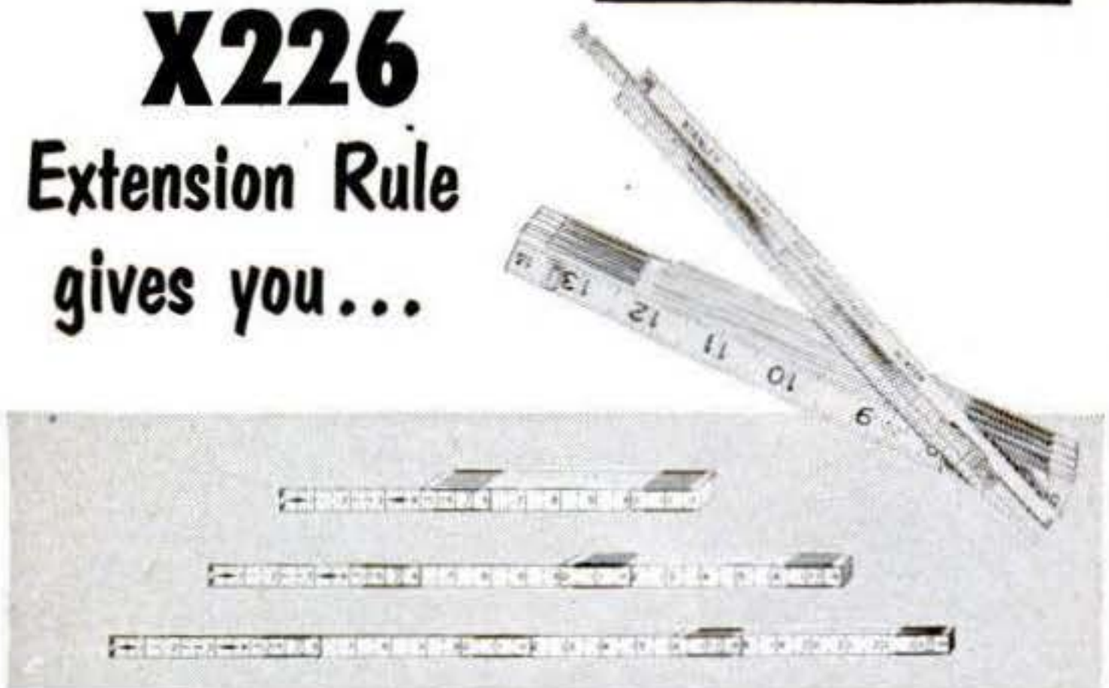

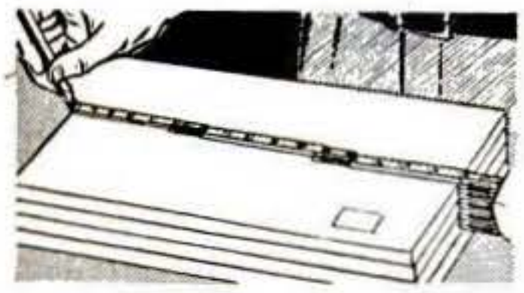

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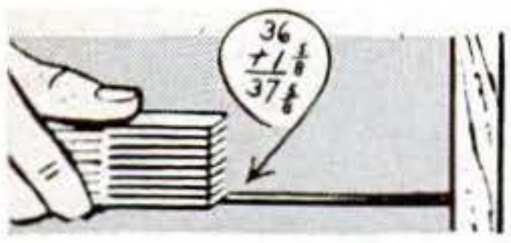

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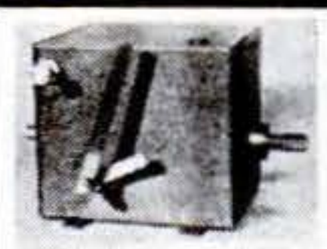

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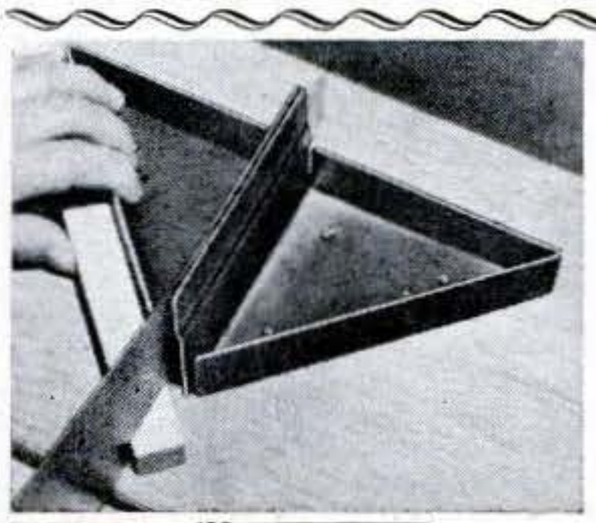

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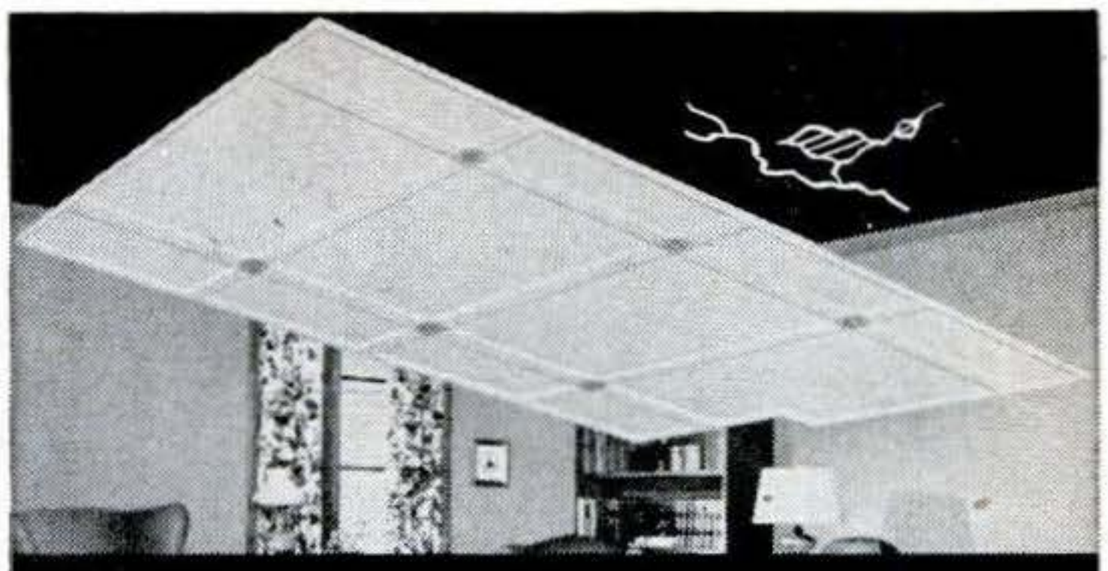

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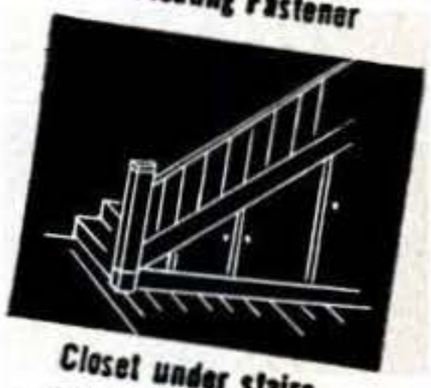

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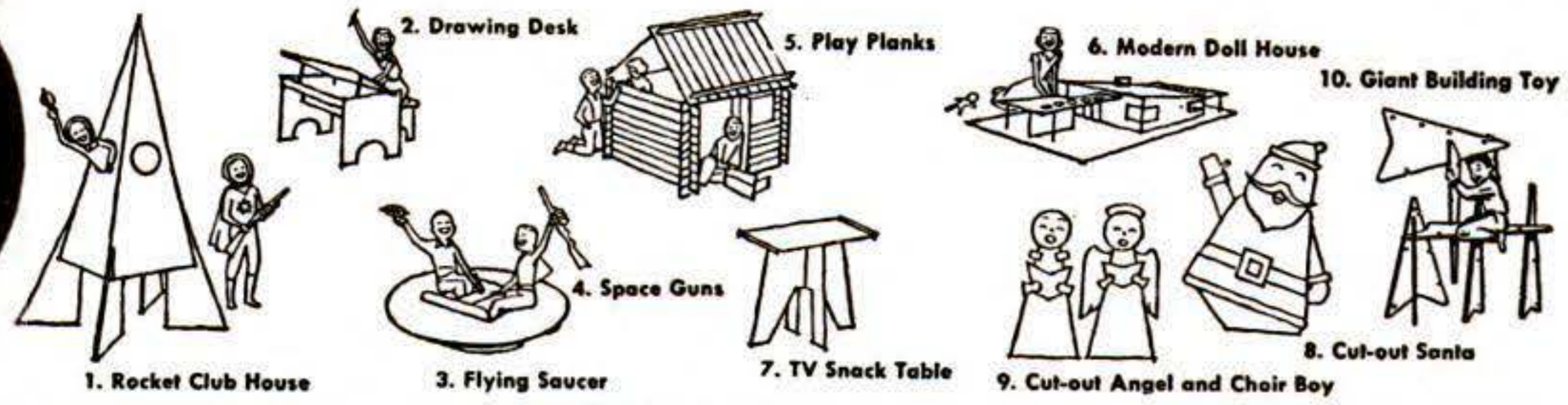

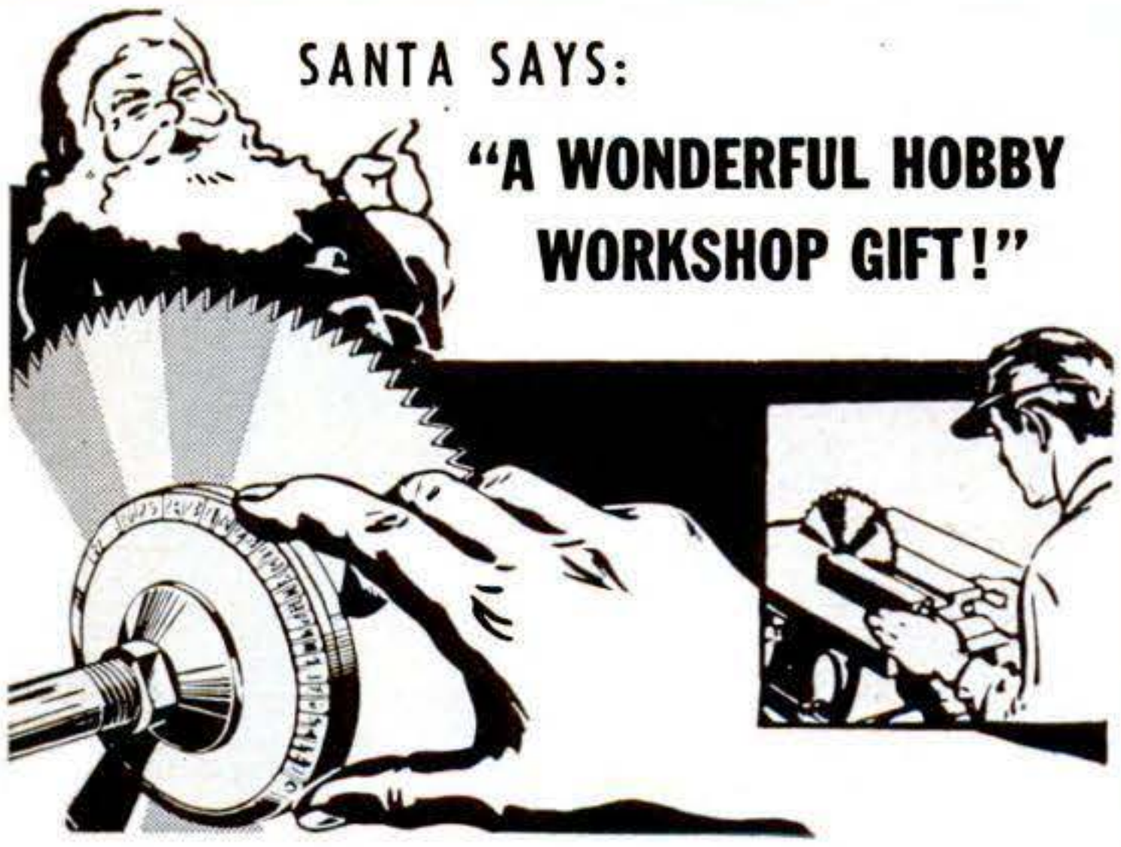

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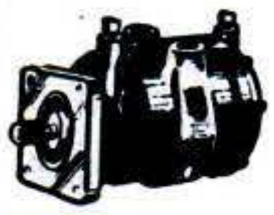

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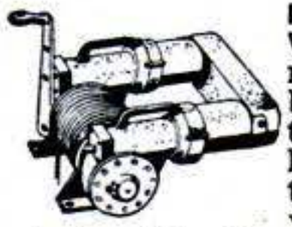

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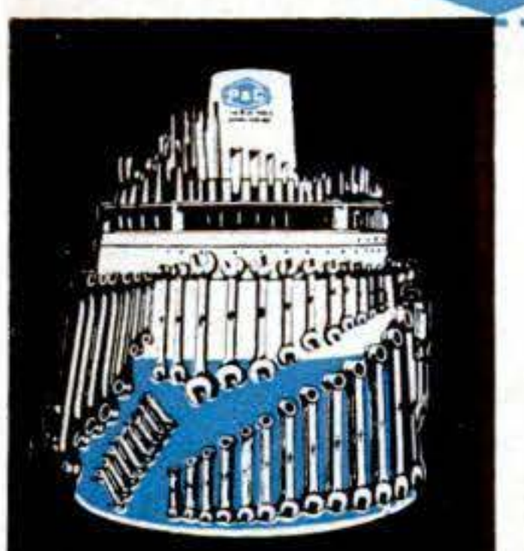

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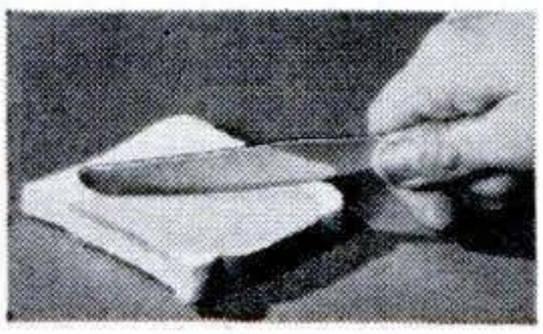

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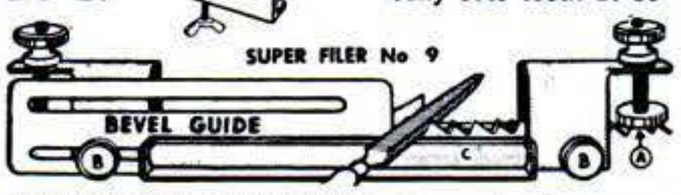
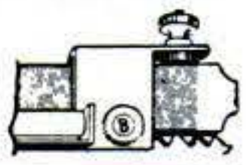


USED AS JOINTER



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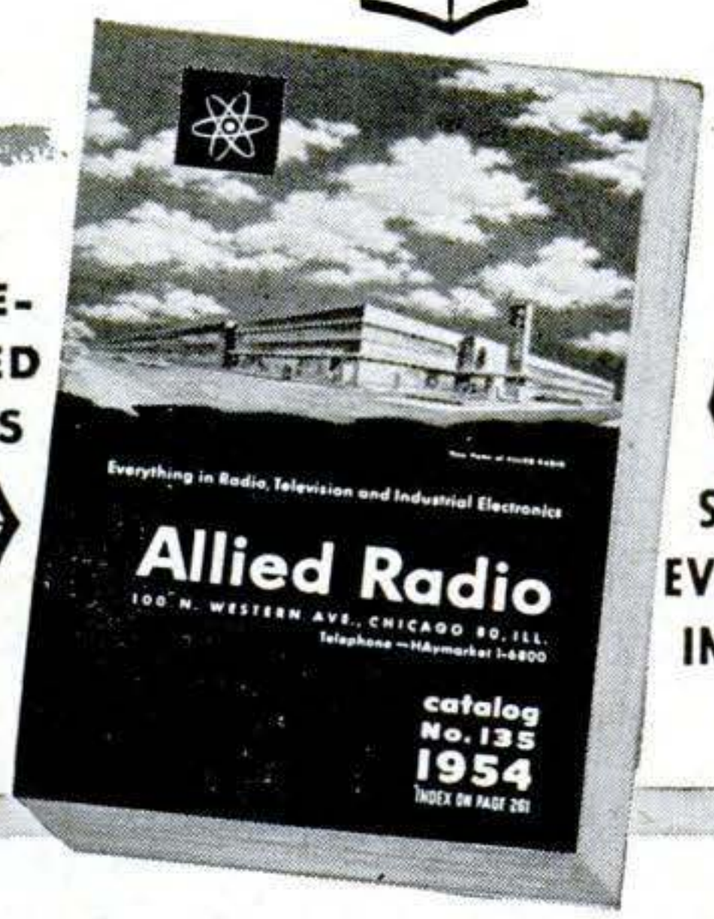

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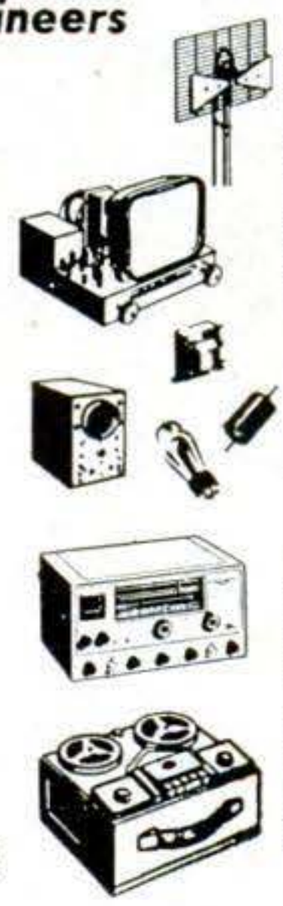

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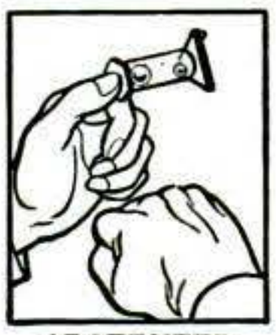

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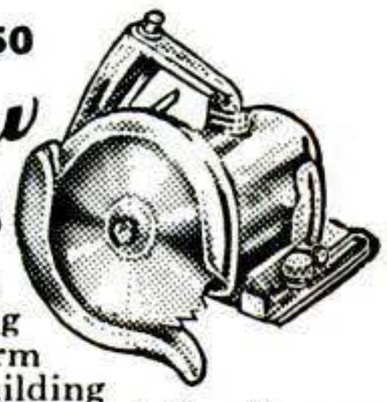

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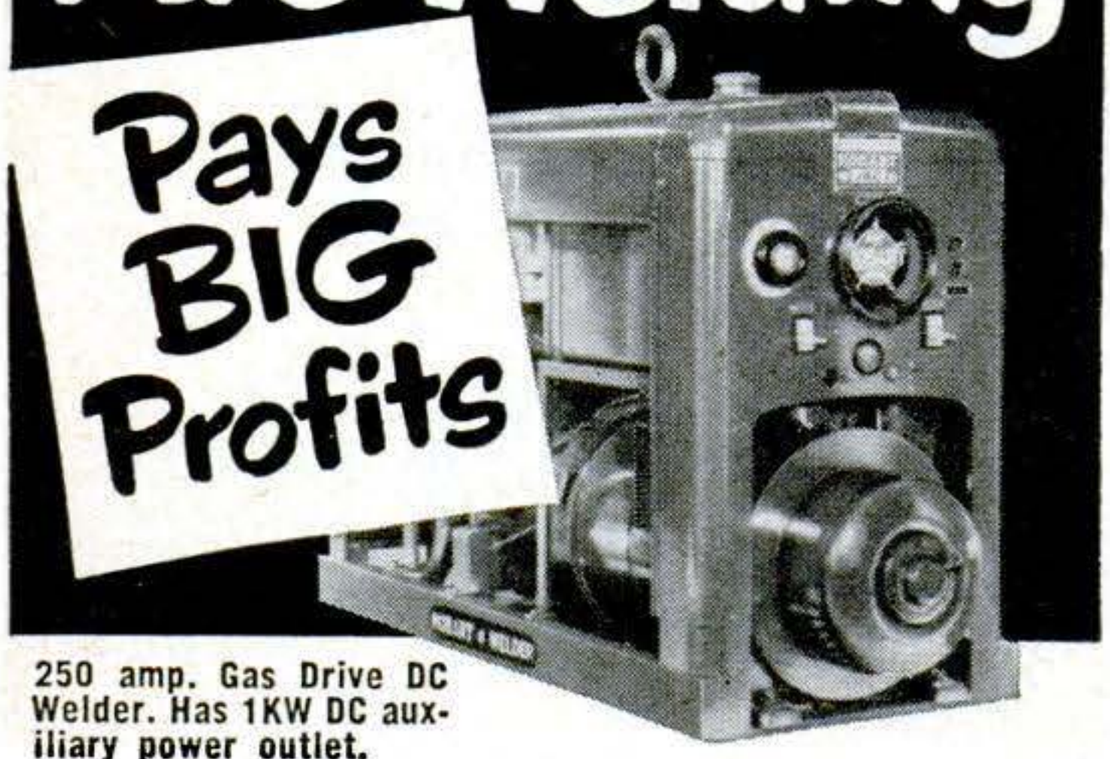

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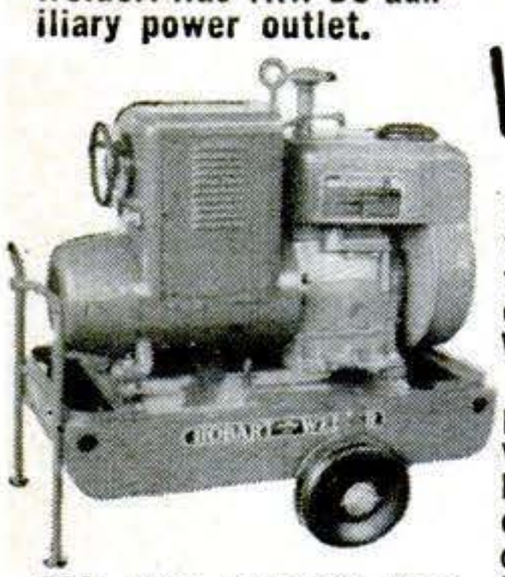

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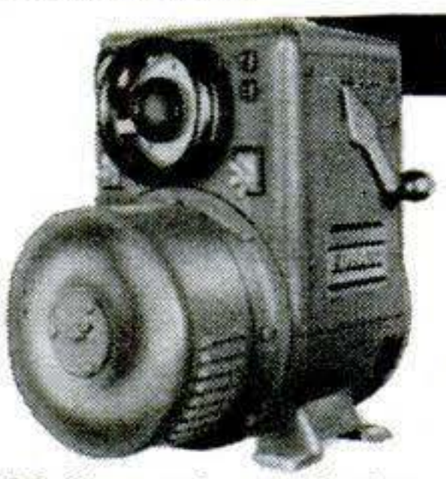

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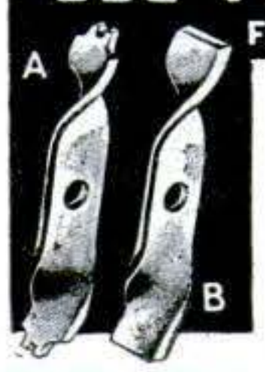

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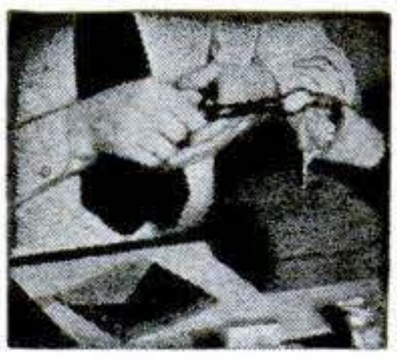

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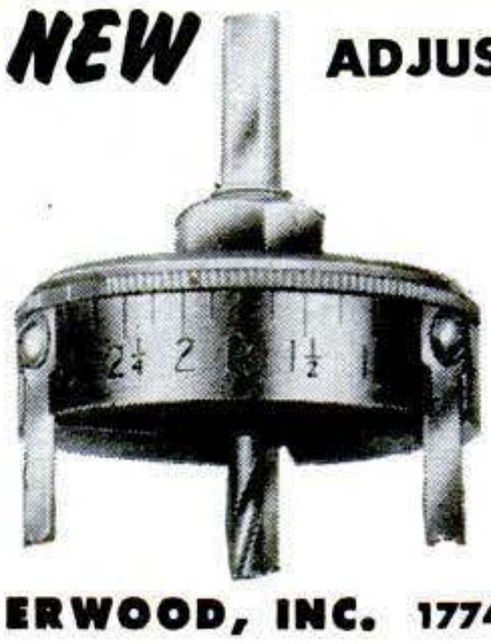

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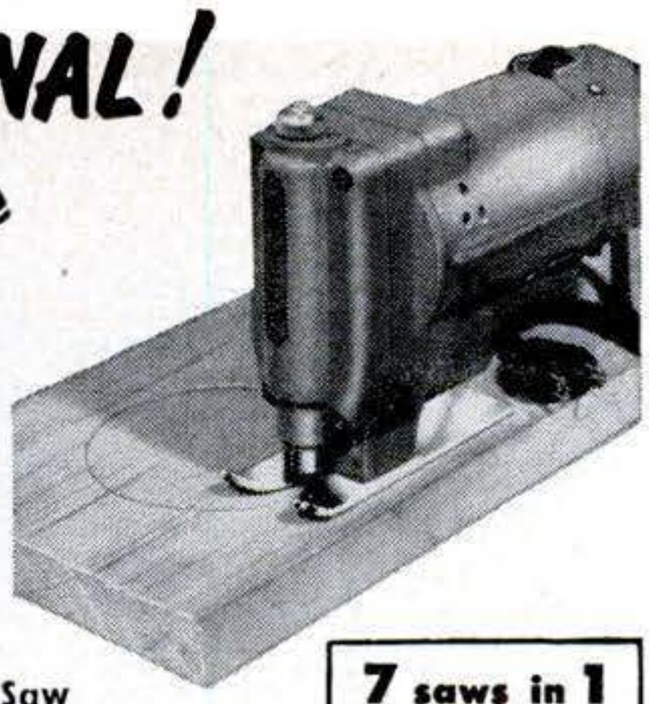

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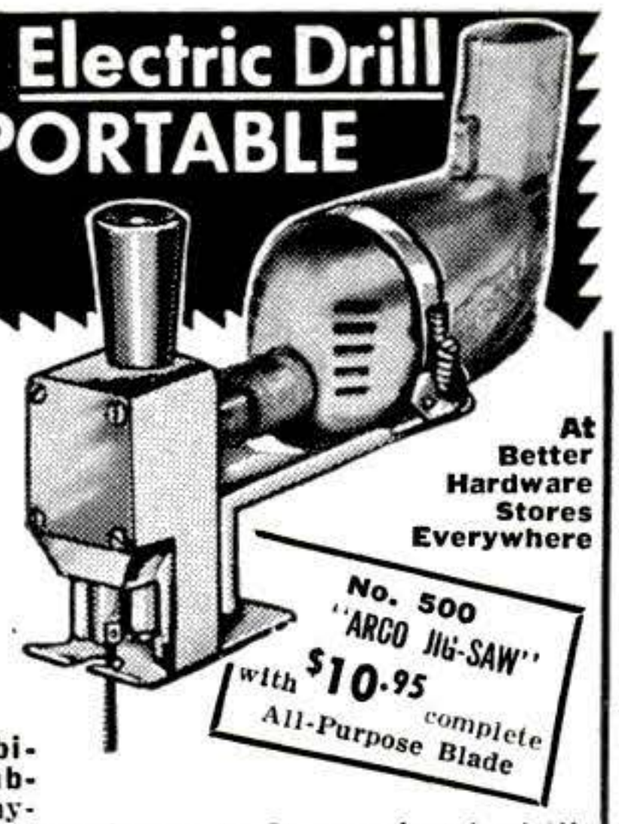

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Attention Homecraftsmen, Cabinetmakers, Electricians, Plumbers! Here for the first time anywhere is a Portable JIG SAW Attachment to fit any electric drill. No need to put in hard-working hours to make fancy cuts by hand. "ARCO JIG-SAW" will handle any project from the smallest to the largest. In minutes you can cut intricate patterns, circles, etc. Make furniture, toys, do all home repairs. Cut openings for plumbing, switchboxes **without boring a starting hole!** Whiz thru plywood, wallboard, plastics, metals—even lumber up to 2x4's! All you do is guide "ARCO JIG-SAW" over your cutting line while air stream blows sawdust away from blade. **Can be used with one hand!**
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90-DAY FACTORY GUARANTEE

HOW TO HAVE A REAL POWER SAW FOR ONLY $12.50

Attaches in one minute to any 1/4" electric drill

'ARCO SAW'

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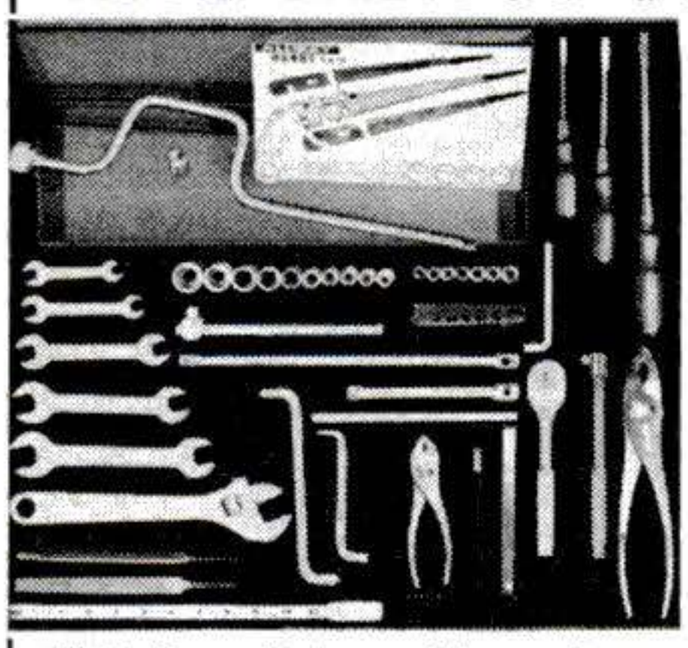

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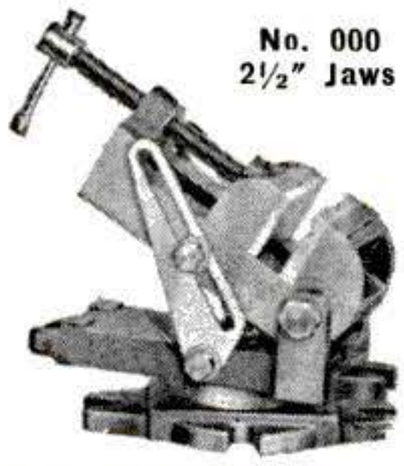

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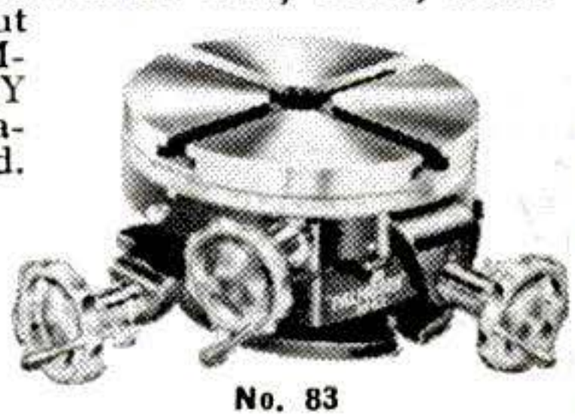

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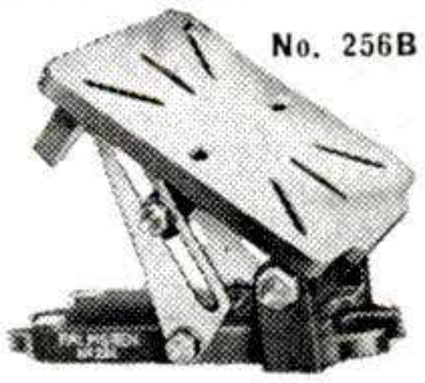

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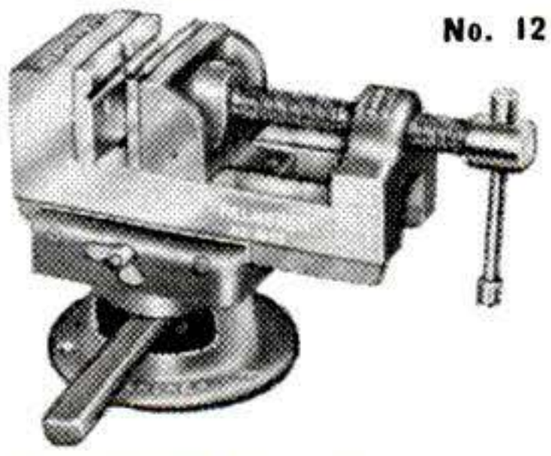

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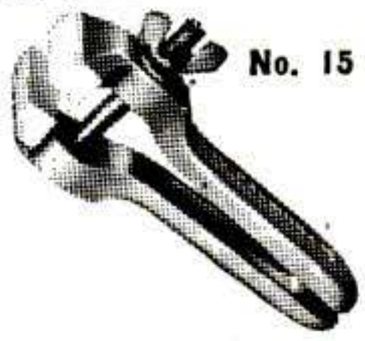

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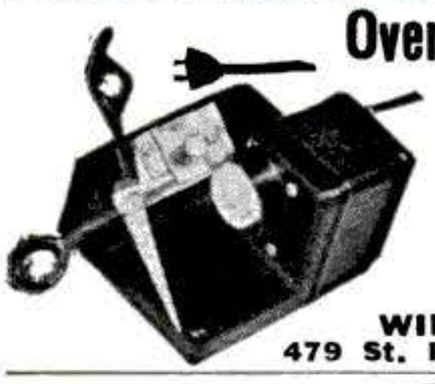

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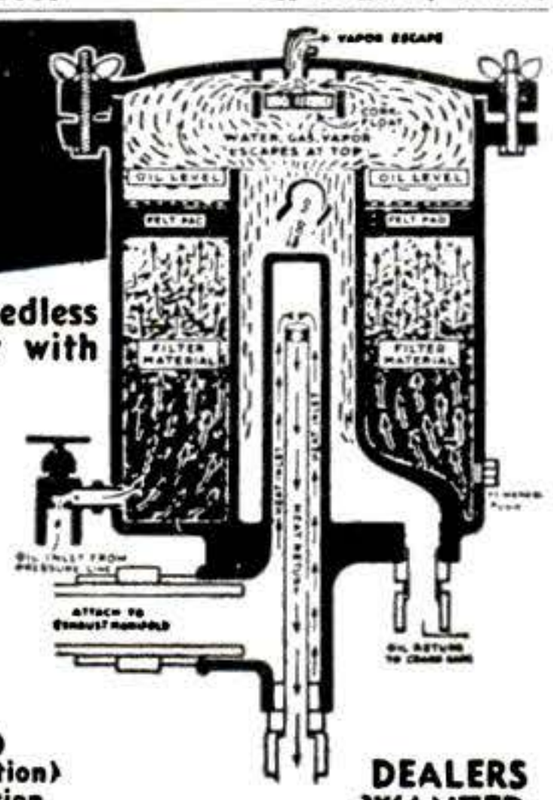

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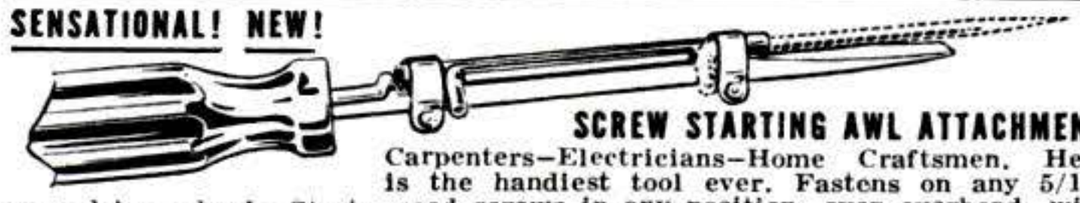

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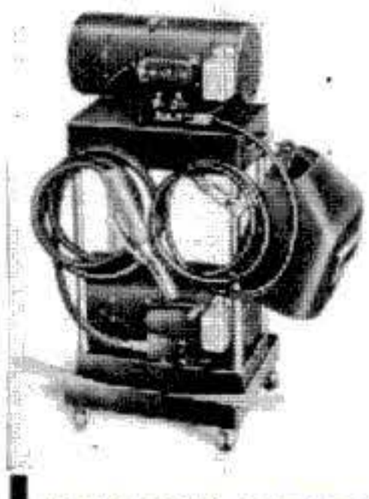

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LARGE VOLUME HYDRAULIC PRESSURE RELIEF VALVE, 3/4" Ports. 1250 P.S.I. and adjustable to 3000 P.S.I. New..... **$4.95** postpaid

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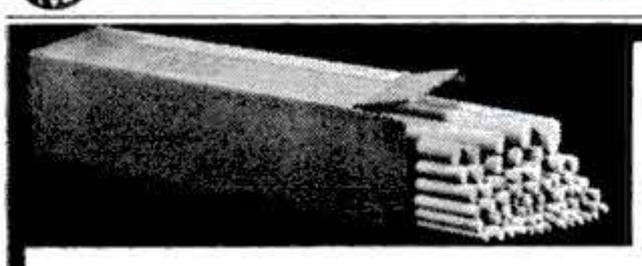

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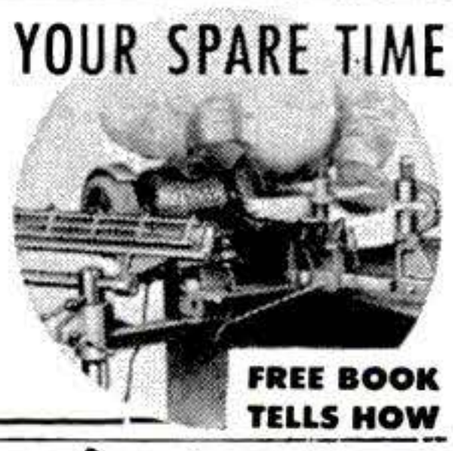

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Now, all alone, you can quickly level points for footings, forms, piping, batter boards, sills, lintels, floors, ceilings, roads, driveways, lawns and all types of construction work without a transit.

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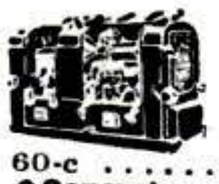

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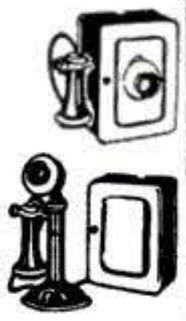

- Genuine W.E. wall or desk phones, same as used on city telephone systems. Useful for inter-communication, private system, extension ringer, etc. Specify "wall" or "desk". Original cost over $20.00. Pre-paid sale, **$4.99** each. Two for **$9.69.**

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EDITORS' IMPARTIAL TESTS PROVE:

New Self-Charging Battery Outlasts, Outperforms Others 221%

A few months ago, we started producing a new battery which we frankly believe to be many years ahead of its time. When we announced that this new battery developed 15 amperes more power than other batteries and would automatically bounce back to life again and again after being deliberately and completely discharged, technical editors of leading magazines raised their eyebrows.

When we added that we had named it the *Life*time Battery because of its *life* (meaning exceptional power) and the *time* it would last (3 to 4 times as long as ordinary batteries), and that we guaranteed it for *six years,* these editors were understandably doubtful, to put it mildly. One publisher, in fact, refused to accept advertising for this battery until what he then considered to be our extreme claims were carefully tested.

One of the editors said: "Let us test this battery, any way we see fit. If it does what you claim, it's news our readers will be interested in. If it's no good, our readers will be interested in that, too, and that's the way we'll write the story." We said "go ahead" and they took a standard *Life*time Battery off the production line and went to work.

You may have read the result of the first test in a famous automotive magazine (name on request). Using two well-known batteries (possibly the best-known high-quality batteries in the world) for comparison, they first ran the *Life*time Battery down completely and let it re-charge itself automatically. They repeated this test 43 times the first day, then compared its strength with the other two batteries. Results: the *Life*time Battery was 204% *stronger* than the *strongest* of the other two batteries. They discharged the *Life*time Battery another 20 times, allowing it to re-charge itself automatically each time, and compared all batteries again: the *Life*time Battery was now 213% stronger than one battery, 221% stronger than the other! Next, they put a punishing 300-amp load on the *Life*time Battery; it survived that in good shape. So they repeated the self-recharging test again and finally concluded: "... unprecedented life expectancy ... remarkable recuperative characteristics ... outperformed the others in every respect and by a comfortable margin ... an outstanding value."

The editor of another magazine (name on request) heard about the tests and asked to "give the thing a *real* test, one that would burn up the average battery." We gave him the *same battery* and challenged him to "finish it off." He installed it in his own car and drove the car on the *battery alone,* shifting gears as he would normally, until his "fingers were sore from holding the starter key ... I hate to admit it, but I was outlasted by a battery."

Still another editor wrote: "... definite battery improvement ... greater recuperative power, greater initial output . obviously high quality."

During independent tests in Alaska and the U.S., the Lifetime Battery was intentionally discharged under sub-freezing conditions, recharged itself automatically & started car at once!

Engineered for Cold Climates

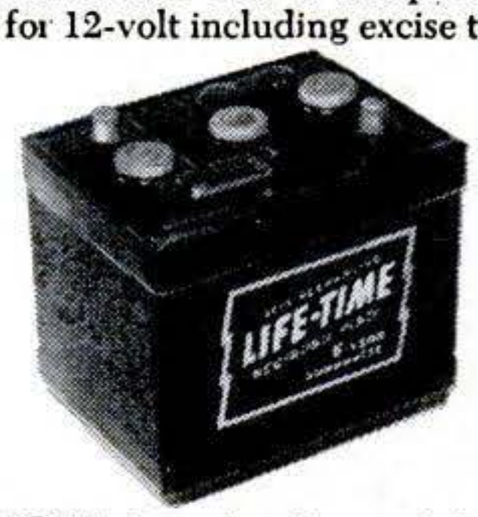
Soon after the *Life*time Battery went into production, we selected a few dealers in northern U.S. and Alaska, shipped them a few batteries and waited to see how the dealers and the public would react. Our Alaska dealer told us that before presenting it to his customers, he was going to give the battery an Arctic test: discharge it completely then freeze it at 30 below zero for 72 hours. Result: the battery had recharged itself and immediately started the car. Immediately we received a telegraphed order from Alaska for $6,043 worth of *Life*time Batteries!

6-Year Guarantee Saves You Up to $107

The average deluxe battery lasts 1 4 years at a typical cost of $25.00, or $107.00 for a 6-year period. This arithmetic is making sense to people who are tired of throwing money away on batteries that just won't hold up. We believe it will make sense to you, too —particularly since the *Life*time Battery you buy now can easily be transferred to your new car whenever you trade in.

12-volt and 6-volt Available

Here's more arithmetic that makes sense. the *Life*time Battery sells in the U.S. at one price for all cars· $29 95 for 6-volt, $34 95 for 12-volt including excise tax.



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☐ 6-volt ($29.95 including tax)
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for_____
(make, model, year of car)

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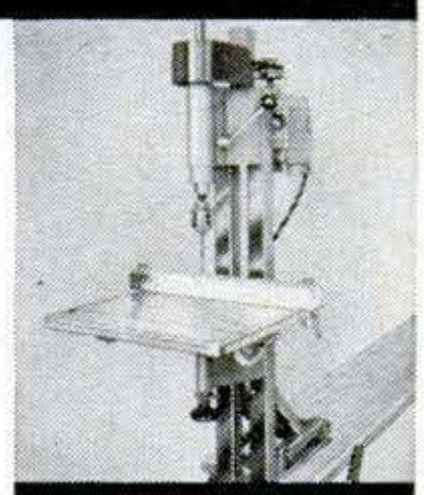

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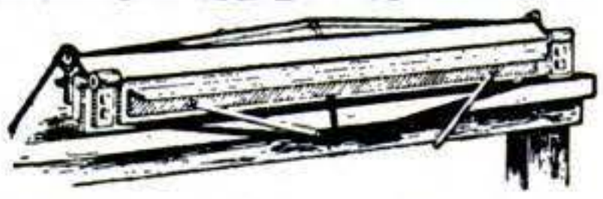

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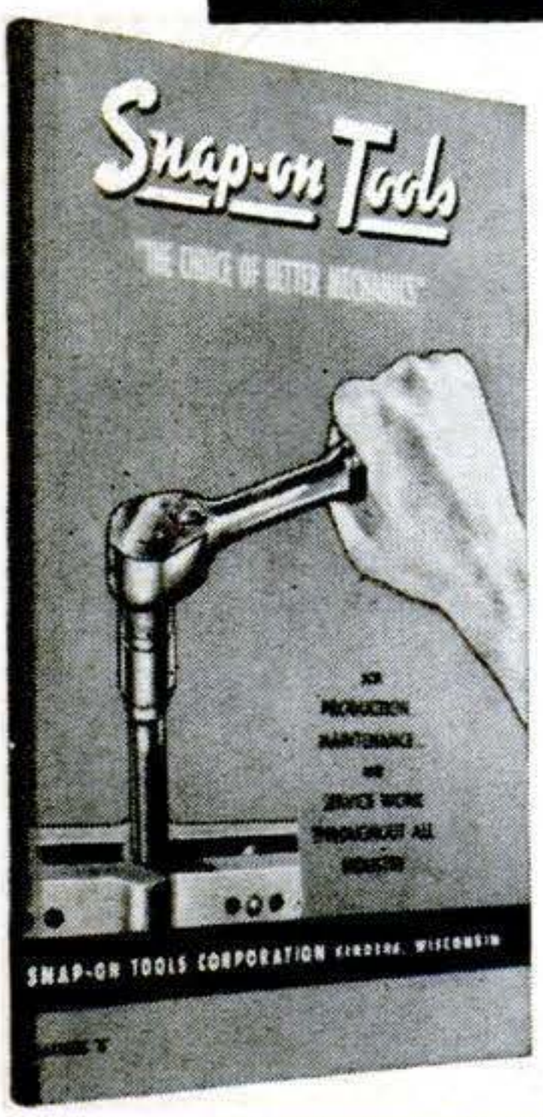

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[Continued from page 173]

cut the switch a few times while making low-speed turns. Knowing how it feels makes it less scary.

One solution to the problem would be to build in a small hydraulic accumulator, like those in aircraft. Coupled with a pressure-loss signal, it would need to maintain service for only a few moments to keep a driver out of trouble. No doubt added cost and complexity are against it, but such an accumulator would undercut a cogent argument against ratio dropping.

It's reliable. Aside from the low-speed stall—a quirk that can hardly be blamed on the unit itself—power steering has earned a very good reputation for reliability.

Broken belts or hose have proved surprisingly rare, considering that the system can involve three-hp. pump loads and 950-pound oil pressures. Maintenance doesn't amount to much—an occasional oil-level check, an infrequent hose replacement. Sometimes a unit will develop valve noise—a low hiss as you turn the wheel one way—or pump noise—a light knocking sound when you turn to full lock, the position of maximum pressure. Neither complaint is common with current units.

There appears to be no record of the kind of failure that could give a driver nightmares: a lunatic boost that cramps the wheel over hard while you're tooling along. A study of the valve circuits indicates that the chances of this seem astronomically remote—it would require a pyramiding of several highly improbable failures.

It's much more likely that your social security number will unlock the combination at Fort Knox.

Driving safety. Power steering may in total actually be safer than manual. It certainly helps your chances in two perilous situations: high-speed blowout of a front tire, and dropping the right-hand wheels off the pavement edge at high speed. In a blowout the chief hazard is the abrupt drag that can take the wheel from the unwary driver; with power you have a strong hydraulic "lever" to keep this drag in check.

In the case where the right wheels are allowed to drop off the pavement, the peril lies in an inexpert attempt to force the car back without slowing down. This can set up an uncontrollable yaw. With both power or manual gear, the sensible thing is to slow down first, and then come back on at a sharp angle.

But with power steering, a driver *can* climb right back up with very little yaw —assuming, of course, that he's dumb enough to try.

This writer, qualified as to dumbness, has let both a Caddy and a Chrysler go off a three-inch concrete edge at 65 m.p.h., and experimentally tried to steer right back on. In each case the power-steered car climbed right back, with only a docile wiggle of her rear end. It is an experiment you might do well to take on faith. END

Old-Fashioned Steam Has New Competitors

HEATING either a house or a chemical kettle used to call for one of the three classical "heat-transfer media": steam, water or air. But modern technology offers new choices:

Dowtherm A, made of diphenyl oxide and diphenyl, and anisole (methyoxybenzene), now serve as heat-carrying liquids and vapors in chemical plants, replacing hot water or steam.

Arochlor 1248, a "chlorinated biphenyl" that stays liquid at 400° to 550°, can be pumped through pipes without corroding them. Rivals include a chemical called tetraryl silicate, a fused-salt mixture known as Hitec and a phenolic compound, Hydrotherm 800.

Now familiar enough to have a nickname, "Nack," from its chemical formula NaK, is the liquid-metal alloy of sodium and potassium that carries heat from atomic reactors to boilers. For higher temperatures, a lead-bismuth alloy may be employed. A gaseous metal, mercury vapor, has been used instead of steam to drive turbines.

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(Item 16) Heavy duty, made of Buna rubber insulated #14-2 conductor, stranded wire encased in a treated braid jacket. **So tough that you can drive over it.** Use indoors or out. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Complete with heavy rubber plug and outlet. (Item 16) 40 ft. (wt. 2½ lbs.) Usually $4.50 Special..... **$1.99**
Combination 2—40 ft. & 1—20 ft. (total 100 ft.) (Item 16c) **$4.95**
100 ft. length (1 piece) (Item 16p)..... **$4.85**

NEOPRENE EXTENSION CORD #16, 2 conducto stranded wire, extremely flexible, ideal for hedge trimmers, lawn mowers, power tools, etc. Tough and rugged, withstands any abuse. Complete with rubber plug and outlet. 40 ft. (Item 17a) wt. 2½ lb. Regularly $4.95 SPECIAL **$2.49**
Combination 2—40 ft. & 1—20 ft. (total 100 ft.) (Item 17n) **$5.95**
100 ft. length (1 piece) (Item 17t)..... **$5.85**
Wire only. No fittings. 100 ft. (Item 17r)..... **$5.00**

NEOPRENE CABLE #14-2 (Item 185) Heavy duty, very flexible, 20 year quality. Wt. 9 lbs. 100 ft. Complete with rubber plug and outlet. *A terrific buy at only* **$8.95**

NO. 12-2 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 199) wt. 8 lbs..... **$6.95**
100 ft. (Item 200).... **$12.95**

37 Pc. SOCKET SET

Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome alloy. Absolutely the best. Complete range of 17 sockets from ¼" thru ½" (¼" drive) and 7/16" thru 1-1/16" (½" drive). 1 extension, reversible ½" ratchet, adapter bit, sliding "T" handle, "L" handle, ½" speeder, 5 pc. alloy combination wrench set, 8 pc. Allen wrench set, and a **big** doghouse tool box. We challenge anyone to match this value. Easily worth $41.95. Wt. 14 lb. (Item 59)..... **$16.95**

44 Pc. SOCKET SET
(Item 596) Same unconditionally guaranteed, non-breakable sockets as above—but with added sizes. Complete range of 21 sockets from ¼" thru 7/16" (¼" drive) & 7/16" thru 1-1/16" (½" drive). Two extensions, reversible ½" ratchet, 3 drift punches, sliding "T" head, all angle coupling, ½" speeder, ¼" breakover, 5 pc. high chrome alloy combination wrench set and 8 pc. offset wrench set in **big** doghouse tool with ample room for other tools. Reg. $49.50 Wt. 16 lb..... **$21.95**

52 Pc. SOCKET SET
(Item 205) Contains a complete set of sockets in ½" drive, ⅜" drive and ¼" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. Beautiful matched chromed thin wall alloy sockets in a sturdy handsome steel box. Wt. 17 lbs. List price $62.90 Factory Special..... **$27.95**

JET FLOW BLOWER

Tremendous air movement (1700 CFM) and quiet operation make this double inlet 10" turbine blower unbeatable for heating, cooling, drying and air conditioning. Ideal for attic or barn ventilation, converting gravity heating to forced air; spray booth exhausts, etc. Operates with any ¼, ⅓ or ½ HP motor. Oversized, long life bearings. Includes variable speed motor pulley and belt. Dimensions 19" hi. x 8 x 16¼". Outlet opening 13"x11⅜". Wt. 45 lbs. (Item 245). Reg. $54.50. Special. **$27.50**
HEAVY DUTY ¼ HP motor for above..... **$16.95**

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PUSH BUTTON START A.C. LIGHT PLANT 600-700 watts—115 v.—60 cyc. A.C. Powered by a rugged 2 hp. easy-starting Briggs gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts., trailers and camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Item 24. Wt. 75 lbs. *Be prepared if war or storm knocks out power lines.* Reg. $275 value.. **$143.50**

700-800 Watt Plant (Item 44) same as Item 24 but larger engine.... **$169.95**

1000-2000 Watt Plant (Item 45) same as Item 24 but larger generator & engine.... **$199.50**

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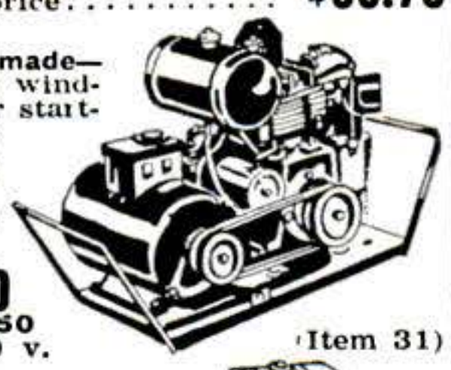
350 Watt Plant (Item 273) 115 v. D.C. 1½ hp. Briggs Engine. Perfect for lights, radios, small power tools Wt. 65 lbs. Factory price..... **$99.75**

GIANT 2000-2500 WATT PLANT



(Item 31)

110-120 V. 60 cyc. A.C. **Absolutely the best made**—exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted—portable. Powered by easy starting Briggs o 6 hp. Wisconsin engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty and complete instructions included. (Item 31) Wt. 210 lbs. Reg. price $585.00. Special at **$299.50**

Generator Only and control box..... **$169.50**

3000-3500 WATT PLANT (Item 198) **110-220** v. 60 cyc. A.C. Belt drive Wis. Engine. **Push button start.** Wt. 370 lbs. Heavy duty **$399.50**

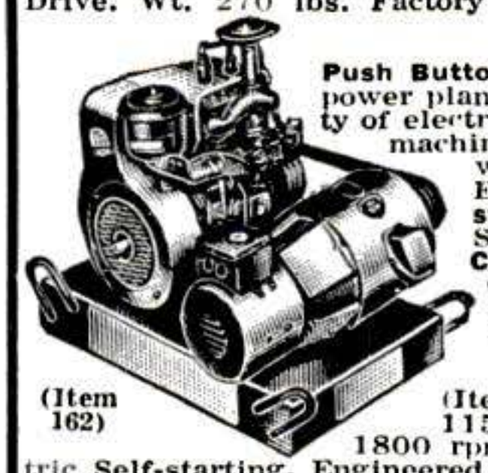
Generator only for belt drive, Wt. 115 lbs. (Item 198A)..... **$239.50**

(Item 21)

MASTER-LITE 2500 Watt Plant 110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 HP Briggs engine, complete with all accessories. Includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 225 lb. Regular price $645.00. Factory price **$329.50**

3500 Watt Plant (Item 23) 115 v. 60 cyc. A.C. **Push Button Start.** Direct Drive. Wt. 270 lbs. Factory Price..... **$379.50**

HI-LINE 6000 WATT PLANT



(Item 162)

Push Button Start, 115-230 v. 60 cycle A.C. A brute of a power plant with a rugged 14 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth $995.00. **With self starter.** Factory price..... **$645.00**
Same plant but **with Crank Start.** (Item 166)..... **$585.00**
Generator and control box only, belt driven. Use your own engine or tractor. Wt. 240 lbs. (Item 163) Factory price.. **$345.00**

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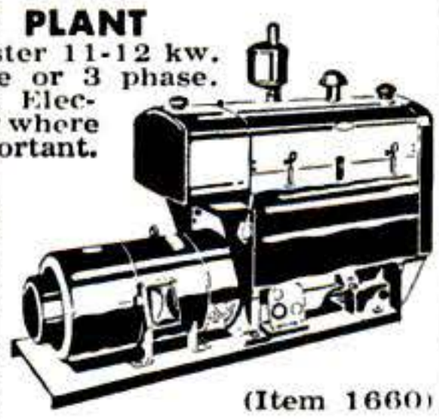

(Item 1660)

(Item 1660) Diesel Master 11-12 kw. 115/230 v. AC. Single or 3 phase. 1800 rpm. direct connected. Electric Self-starting. Engineered for permanent power where continuous low cost, heavy duty service is important. Wt. 1350 lbs. Reg. list $3650.00. Factory price..... **$1895.00**

10-11 kw. **GAS DRIVEN PLANT.** 115-230 v. 60 cyc. AC. Single or 3 phase, powered by 4 cylinder Wisconsin air cooled engine. Belt driven. Constructed similarly to Hi-Line 6 KW shown above but much larger. (Item 217) (with crank start) Wt. 900 lb. Factory price **$1075.00**

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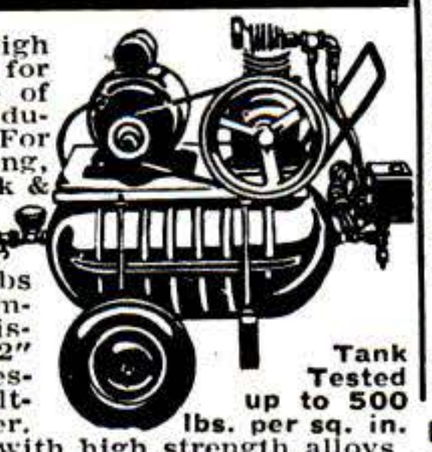
HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super efficient fan moves huge volume of air. (400 to 600 CFM).

8" Fan, wt. 5 lb.....**$6.85**
9" Fan, wt. 6 lb.....**$7.85**
10" Fan, wt. 7 lb.....**$8.85**
12" Fan, wt. 8 lb.....**$9.85**

HEAVY DUTY FAN, Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E) **$11.95**
12" Fan, wt. 10 lbs. (Item 10D) **$12.95**

MASTER AIR COMPRESSOR



(Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck & auto tires, greasing & the hundreds of other jobs done by compressed air. Piston type. 2" bore compressor with built-in air filter. **Tank Tested up to 500 lbs. per sq. in.** Master built with high strength alloys and precision bearings. **Stainless steel tank,** 12"x24", 2100 cu. in. cap. Heavy duty automatic switch starts and stops motor to maintain desired pressure (up to 150 lb.). Has check valve, safety valve, gauge, shut-off valve. 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Low factory prices.

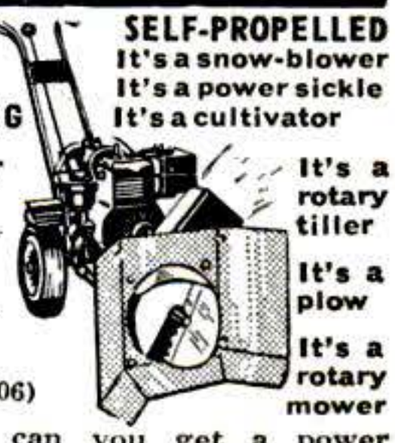
With ⅓ hp. motor, 110v. AC motor. Reg. $175. (Item 209p)..... **$109.50**
With ½ hp. motor. Reg. $199.50 (Item 209Ap). **$129.50**
2 hp. Briggs Gas Engine. Reg. $199.50. (Item 209Bp)..... **$119.50**

FLEXIBLE SHAFT

A precision built, heavy duty tool with amazing flexibility. Replaces a dozen individual tools—drills, buffs, grinds, sands, saws — handles jobs in impossible places. Fits any ⅜" motor shaft or use with drill press, grinder, lathe, gas engine, etc. Heavy duty ⅜" piano wire core encased in tough rubber housing. Handle and arbor have rugged industrial type precision ball bearings for years of service. Arbor takes all ½" bore wire wheels, grindstones, etc. ½"—20 standard threads. Use with any ¼, ⅓ or ½ hp motor. Wt. 10 lbs. Reg. $29.95.... **$15.95**

(Item 240)

MASTER GARDENER



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It's a snow-blower
It's a power sickle
It's a cultivator

Tractor shown with Snow Blow Attachment

It's a rotary tiller
It's a plow
It's a rotary mower

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Where can you get a power tool that does so many jobs? Works for you the year 'round. Does terrific job of cleaning snow from walks, drives, etc. without backbreaking work. Also prepares deep mellow seed beds, cuts weeds, lawns, etc. The Master Gardener performs better—does more than tractors costing twice as much. Converts in minutes to Tiller, Power Sickle, etc. Basic, self-propelled 2 hp. tractor. Briggs or Clinton engine.. **$119.50**

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Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to ¾" plate using ¼" rods. Built-in air cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 14 hp gas engine or 7 hp elec. motor. Complete with instructions, guar. and double V belt or flat pulley. You can pay more, but you can't buy a better welder. (Item 38) Wt. 110 lbs. $400 value at.. **$99.75**

DUAL CONTROL MODEL same as above but with built-in dual rheostat for low heat soldering, brazing, welding. Special..... **$119.50**

WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at..... **$10.50**

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Send check or M.O. Prices f.o.b. Factory. 10 day Money back guarantee. Send 10c for BIG Catalog.

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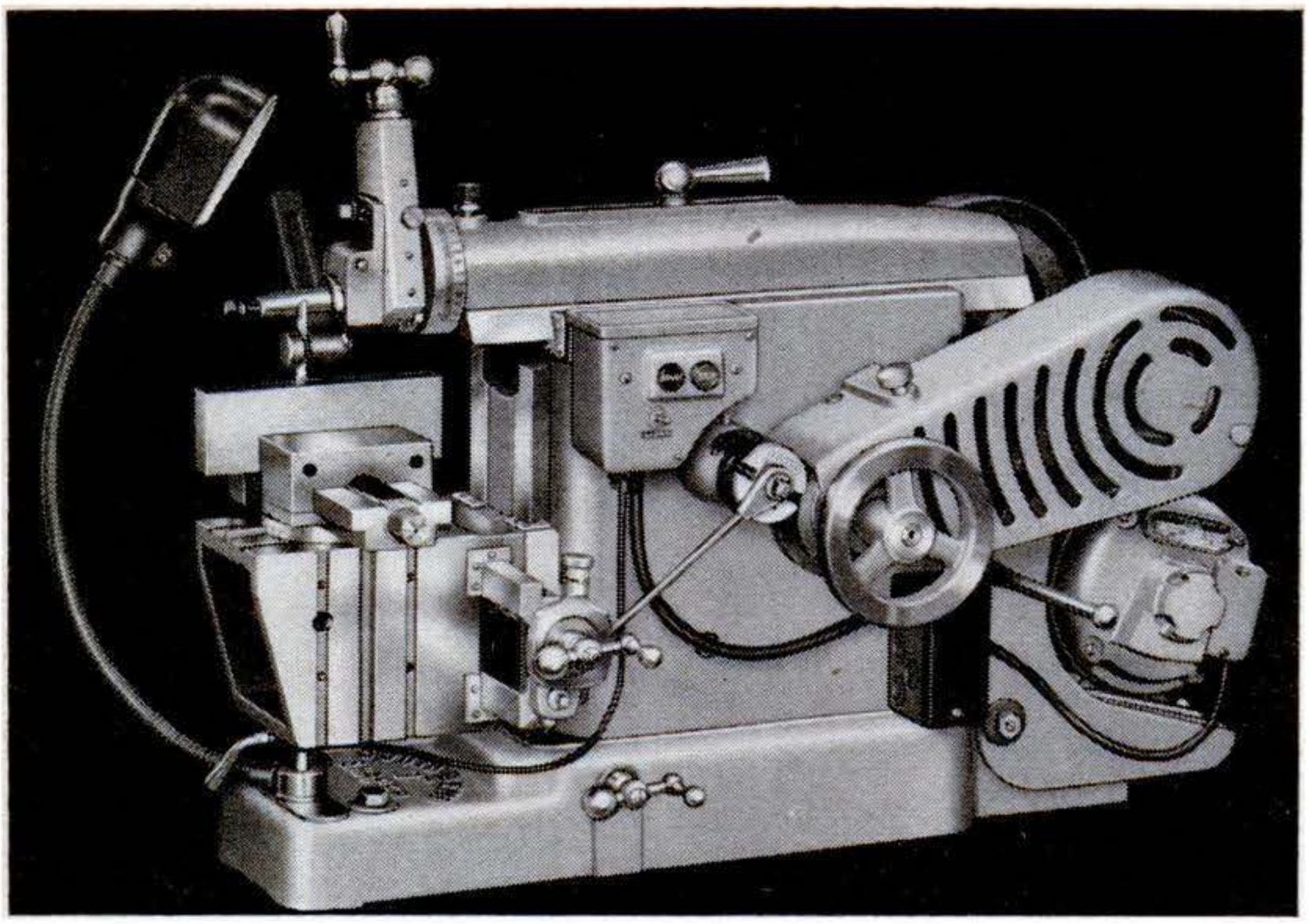
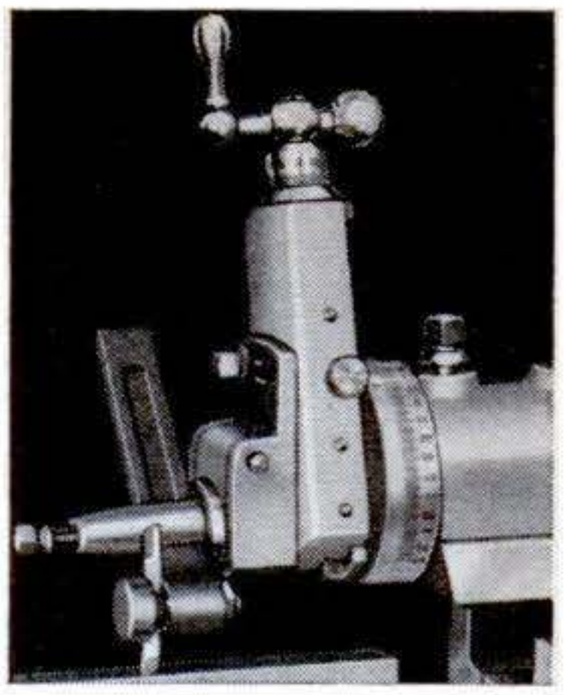
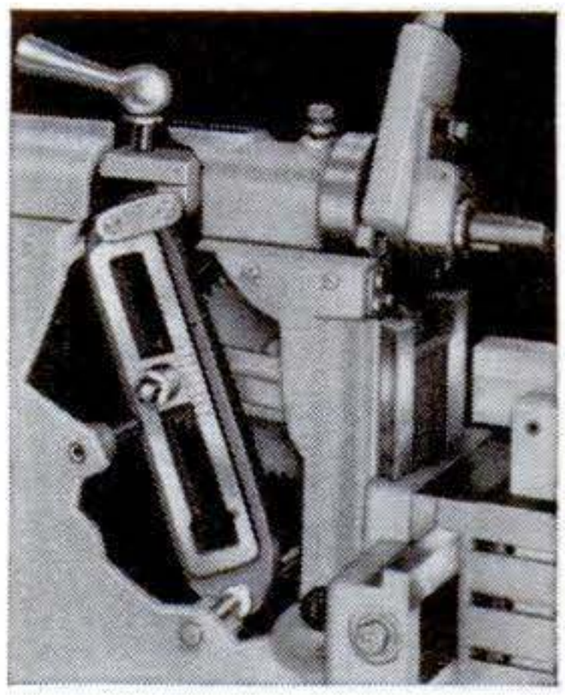
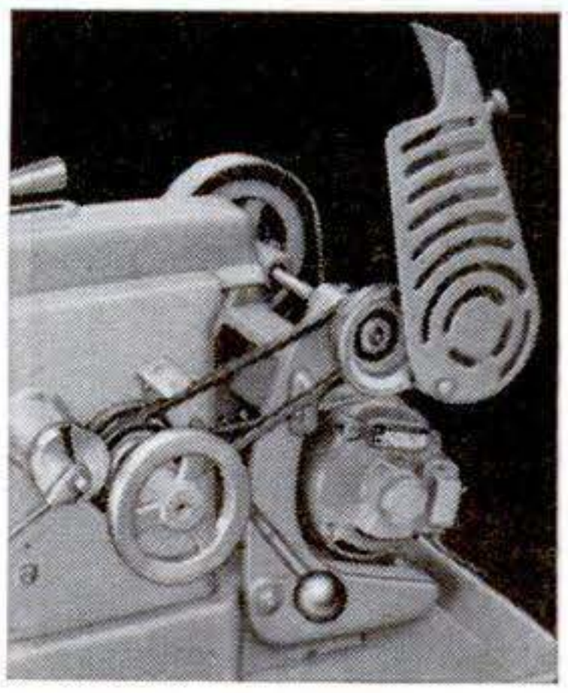




Tool head locks in any position. Rugged clapper box is adjustable.



Rocker and crank with graduated eccentric adjustment for stroke.



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7" PRECISION SHAPER

Precision engineered and sturdily constructed, this compact bench shaper has the built-in accuracy and rigidity for rapid machining on small parts. The stroke rate per minute is higher than for larger shapers, permitting greater production on work within its capacity. The ease of setting up work in the bench shaper, its high operating speeds, and low power consumption keep costs at a minimum. A number of practical attachments can be supplied to increase its versatility on toolroom, production, or maintenance work. Check coupon for literature.

SPECIFICATIONS: RAM—Stroke length—0 to 7". Strokes per minute (4)—42 to 195. Cutting speeds—3 to 114 feet per minute.

TOOL HEAD—Vertical feed—3". Swivels—360°. Tool post opening—13/32" x 7/8".

TABLE—Horizontal travel—9 1/2". Vertical travel—5". Power cross feeds (6)—.002 to .012". Ram clearance—1/2 to 5-1/2". Table size—5-3/8 x 5 x 6-5/16".

VISE—Jaw width—4". Jaw depth—1". Maximum opening—4". Swivel base.

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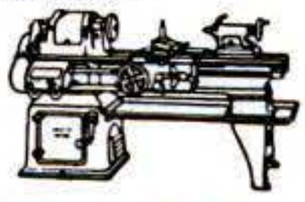
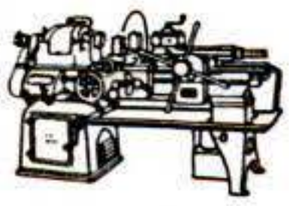


☐ 10" to 16-24" FLOOR LATHES

☐ DRILL PRESSES

☐ TOOL GRINDERS



☐ ½" & 1" Collet TURRET LATHES

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ROTHLAR 3X, 40 BINOCULARS
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Here at last—the all NEW, improved Roth binoculars with the famous 3X, 40 Klaroptar lenses—now better than ever before! They're more refined, sharper, clearer, 3 ways better than the sensational 1953 model! When we announced the '53 model we were swamped with over 50,000 orders! We were sold out and forced to hold up thousands of orders. Unfortunately, we disappointed lots of nice folks! This time we're taking no chances! We're strictly limiting orders to ONE 1954 model per family and will sell NONE to dealers!

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The secret of ROTHLAR'S great public acceptance is the precision made 3X, 40 lenses. Unlike other glasses, they are not moulded or stamped out on plastic presses. These new 1954 genuine Klaroptar lenses are ground out ONE BY ONE by proud German optical workers! This takes much more time and limits production. BUT WHAT A DIFFERENCE! This latest model gives you sharper, clearer, magic like viewing. No annoying distortions! No chromatic fringe to cause eye-strain! ALL Klaroptar lenses are turned out under the supervision of WALTER ROTH in his small factory in Hartmannshof, Western Germany. He has the Old World family pride. Herr Roth simply won't let an inferior product bear his name. Naturally this means you get a really superior binocular if you are one of the lucky people to order this optical instrument!

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